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Master in Management Program

SUPPLY CHAIN COLLABORATION: IMPACT ON FIRMS' PERFORMANCE

Master's Thesis by the 2nd year student

Concentration — International Logistics & Supply Chain Management

Anastasia Lebedeva

Research advisor:

Nikolay A. Zenkevich, Associate Professor

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ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

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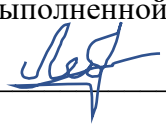

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I, Anastasia Lebedeva, (second) year master student, program «Management», state that my master thesis on the topic « Supply Chain Collaboration: impact on firms' performance», which is presented to the Master Office to be submitted to the Official Defense Committee for the public defense, does not contain any elements of plagiarism.

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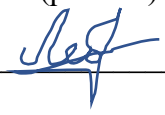

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АННОТАЦИЯ

Автор	Лебедева Анастасия Алексеевна
Название ВКР	Сотрудничество в цепях поставок: влияние на результаты деятельности фирм
Направление подготовки	Международная логистика и управление цепями поставок
Год	2017
Научный руководитель	Зенкевич Николай Анатольевич, кандидат физ.-мат. Наук, доцент
Описание цели, задач и основных результатов	Цель данного исследования – определить, оказывает ли сотрудничество в цепи поставок (СЦП) положительное влияние на результативность фирм. Для достижения указанной цели были поставлены следующие исследовательские задачи: (1) на основе литературного обзора изучить концепцию СЦП, определить её основные элементы; (2) построить концептуальную модель взаимосвязей между СЦП и результативностью фирм; (3) на основе эмпирических данных протестировать модель взаимосвязей между СЦП и результативностью фирм на примере дистрибутивной сети. Результаты моделирования структурных уравнений показали, что сотрудничество в цепи поставок оказывает положительное непрямое воздействие на операционную результативность фирм посредством достижения преимуществ от сотрудничества. Более того, СЦП оказывает прямое положительное воздействие на преимущества от сотрудничества, в то время как преимущества от сотрудничества оказывает прямой положительный эффект на операционные результаты и общую результативность фирм.
Ключевые слова	Сотрудничество в цепи поставок, дистрибутивные сети, результативность

	фирм, преимущества от сотрудничества, моделирование структурных уравнений

ABSTRACT

Master Student's Name	Anastasia Lebedeva
Master Thesis Title	Supply Chain Collaboration: impact on firms' performance
Main field of study	International Logistics and Supply Chain Management
Year	2017
Academic Advisor’s Name	Nikolay A. Zenkevich, Associate Professor
Description of the goal, tasks and main results	The purpose of this study is to identify whether supply chain collaboration has a positive impact on firm performance. The following research objectives were set to achieve the stated purpose: (1) based on the literature review, examine the concept of SCC and determine its key dimensions; (2) develop a conceptual model of the relationship between SCC and firm performance; (3) test empirically the model of the relationship between SCC and firm performance using the example of a distribution network. The results of structural equation modeling showed that supply chain collaboration had a positive and significant indirect effect on operational performance mediated by collaborative advantages. Moreover, SCC had a significant positive direct impact on collaborative advantages, whereas collaborative advantages had a significant positive direct influence on firm performance.
Keywords	Supply chain collaboration, distribution networks, firm performance, collaborative advantage, structural equation model

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LIST OF ABBREVIATIONS AND ACRONYMS

ASV – Average shared variance

AVE – Average variance extracted

CA – Collaborative advantage

CFA – Confirmatory factor analysis

CFI - Comparative fit index

CPFR – Collaborative planning, forecasting, and replenishment

CR – Composite reliability

CR – Continuous replenishment

ECR – Efficient consumer response

EDI – Electronic data interchange

FP – Firm performance

IT – Information technology

MSV – Maximum shared variance

OP – Operational performance

R&D – Research and development

RMSEA - Root mean square error of approximation

RQ – Research question

SC – Supply chain

SCC – Supply chain collaboration

SCCD – Supply chain collaboration dimensions

SCM – Supply chain management

SCN – Supply chain network

SEM – Structural equation modeling

VMI – Vendor managed inventory

INTRODUCTION

Research Background. Today organizations operate in a highly uncertain and competitive business environment, which is characterized by rapidly changing patterns of consumer behavior, shorter product life cycles and high speed of innovations. Such an environment induces firms to develop value-added activities that ensure reduced development cycles and greater responsiveness, as well as the timely delivery of innovative, high-quality and low-cost products (Fawcett and Magnan, 2004). In this regard, the proper supply chain management is gaining more importance for the firm's ability to achieve and sustain the competitive advantage (Christopher, 2011). Moreover, nowadays the competition is taking place between supply chains rather than between companies. For that reason, an increasing number of firms recognize the fallacy of the adversarial relationship in the supply chain and instead look for opportunities to collaborate with their supply chain partners to achieve greater efficiency and responsiveness (Christopher, 2011).

The extensive development of supply chain technologies, tools and applications such as traceability systems, Quick Response, Efficient Consumer Response (ECR), Collaborative Planning, Forecasting and Replenishment (CPFR) and Vendor Managed Inventory (VMI), has facilitated collaboration among multiple participants in the large-scale supply networks, moreover the implementation and use of these technologies have required firms to undertake a collaborative approach and make joint efforts (Soosay and Hyland, 2015).

The value created by collaboration in supply chains is determined by its ability to help firms to match supply and demand more effectively with the aim of improving the overall performance (Simatupang and Sridharan, 2008).

Problem Statement. Although many researchers have reported in their studies that collaboration in the supply chain is associated with improved firm performance (Vereecke and Muylle, 2006; Cao et al., 2010; Nyaga et al., 2010; Allred et al., 2011; Kumar and Banerjee, 2014) and other benefits (Barratt and Oliveira, 2001; Simatupang et al., 2004; Min et al., 2005; Fawcett et al., 2008), in reality many firms fail in achieving the high level of collaboration required for a significant increase in their performance (Ellinger et al., 2006; Min, et al., 2007; Nicovich et al., 2007, Fawcett et al., 2015). Moreover, there is research revealing that only a small number of companies managed to extract benefits from collaboration and achieve high performance levels by means of collaborative practices (Barratt and Oliveira, 2001; Min et al., 2005; Ellinger et al., 2006; Nicovich et al., 2007; Fawcett et al., 2012). Thus, it remains still unclear in which precise way collaboration impacts firms' outcomes and whether it always leads to the expected benefits. The literature on the supply chain collaboration is often fragmented, focusing on a small number of various factors, which lack sound empirical support, and paying little attention to fundamental

aspects of collaboration. Thus, extant studies on effects of the supply chain collaboration on firms' performance demonstrate inconsistent results, further research is needed to discover the value of collaborative practices for the firms in the supply chain. Therefore, this master thesis will address the existent research gap.

The **subject** of the master thesis is supply chain collaboration, which is defined in this study, according to Cao and Zhang (2011), as "a partnership process of two or more independent firms that work closely to plan and execute supply chain operations towards shared goals and mutual benefits".

The **object** of the study is the relationship between the focal firm and its partners in the supply chain. Here, a supply chain stands for the "network of organizations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer", as defined by Christopher (2011).

The **purpose** of this study is to identify whether supply chain collaboration has a positive impact on performance of firms.

In order to achieve the purpose of the study, the following **objectives** were set:

1. Based on the literature review, examine the concept of SCC and determine its key dimensions.

2. Develop a conceptual model of the relationship between SCC and firm performance.

3. Test empirically the model of the relationship between SCC and firm performance using the example of a distribution network.

In this regard, the following **research questions** have to be answered:

RQ1: What are the key dimensions of supply chain collaboration and how do they relate to performance of firms?

RQ2: What areas of collaboration are the most important for the organizational performance?

RQ3: What are the crucial collaborative advantages and how do they influence the relationship between supply chain collaboration and operational performance of firms?

Research methodology. For the purpose of the study conducted within this master thesis the explanatory and deductive approach was chosen, since a theoretical framework was developed and then tested empirically. Data were obtained through a web questionnaire survey of suppliers of a Russian distributor operating in the electrical industry. Hypotheses about the relationships between supply chain collaboration and firms' performance were deduced from the Supply Chain Management literature, then the measurement of the identified variables was proposed, and, finally, the deduced hypotheses were tested using the quantitative data. The data were collected

by means of the web questionnaire formulated on the basis of the theory and literature review. The results of the questionnaire were processed through descriptive and inferential statistics, Pearson correlation, linear and multiple regression and confirmatory factor analysis and structural equation modeling.

Scope and delimitations of the study. Although collaboration involves at least two participants, the proposed study focused on the perspective of the supplier firms in the supply chain. According to the chosen perspective, this master thesis explored the perceptions and attitude of the supplying firms only. Besides that, delimitations of the current study include industry sector of analysis, since the distribution network investigated in this thesis includes firms representing the electrical industry.

Outline of the paper. This master thesis consists of several parts, namely: introduction, chapters from one to three, conclusion and implications, limitations and further research, list of references and appendices. The introduction includes the research background, problem statement, the purpose and objectives of the research, main research questions of the study, a brief description of the research methodology, specification of the scope and delimitations of the study, and the outline of the paper. The first chapter presents a critical overview of previous research on supply chain collaboration. In order to provide some basic overview of the SCC concept, the first chapter starts with background of the research on SCC and the definition of SCC. The critical literature review encompasses such aspects of SCC as benefits, enablers and barriers of SCC, SCC dimensions, and collaborative advantages. The final part of the first chapter is devoted to the structure of the distribution network and its specific features. The second chapter specifies methodology and research design of the study, including the conceptual framework and hypotheses development, methods of the research and data analysis, the design of the study and detailed description of the data collection. The third chapter provides data analysis results, namely the results of correlation and regression analysis, confirmatory factor analysis, the structural equation model of supply chain collaboration, and the mediation effect of collaborative advantages. The following part includes conclusions, theoretical contributions and managerial implications of the obtained results. Next, an overview of limitations of the study and suggestions for further research are provided. This part is followed by the list of references and appendices.

The results of the conducted research have been submitted to the eleventh Conference on Game theory and Management and will be published in the collection of papers called "Contributions to Game Theory and Management"[1].

[1] Nikolchenko, N. and Lebedeva, A. 2017. Integrative Approach to Supply Chain Collaboration in Distribution Networks: Impact on Firm Performance. The eleventh Conference on Game theory and Management: in print

1. SUPPLY CHAIN COLLABORATION: A LITERATURE REVIEW

1.1. Background of Research on Supply Chain Collaboration

Supply chain collaboration is considered an important research topic that has been receiving a growing attention in the field of supply chain management over the recent years (Soosay and Hyland, 2015). An increasing number of companies are trying to implement collaborative practices in their supply chains in order to achieve efficiency, responsiveness and competitive advantage (Nyaga et al., 2010). Some successful examples of such companies include Procter and Gamble, Hewlett-Packard, Dell and IBM, who launched long-term collaborations with their supply chain partners (Barratt and Oliveira, 2001; Cao and Zhang, 2013). This trend prompted some researchers to suggest that improved performance cannot be achieved by a firm alone, but requires involvement of all supply chain participants and alignment of their practices and business models towards increased coordination (Hult et al., 2007).

The concept of collaboration has been explored in various research areas: education (Newman and Hermans, 2008), software development (Amrit and Van Hillegersberg, 2008), nonprofit ventures (Simo and Bies, 2007), virtual collaboration (Blaskovich, 2008) and many others. Collaboration in the context of supply chain is still an immature subject, which appeared in the mid-1990s as Collaborative Planning, Forecasting, and Replenishment – CPFR and since 2000s has attracted both practitioners and researchers (de Oliveira et al., 2016). Besides CPFR, many other collaborative practices were introduced in the field of supply chain management: Vendor Managed Inventory (VMI), Efficient Consumer Response (ECR), Continuous Replenishment (CR), and Electronic Data Interchange (EDI) that enabled proactive joint planning and coordination of business activities and processes (Cao and Zhang, 2013). These and other collaborative initiatives are aimed at achieving better supply chain performance, namely more accurate forecasts, timely information, reduced costs, lower levels of inventory, and improved customer service. Firms undertaking collaborative practices with members of their supply chain expect to reduce the demand uncertainty and improve the quality of decisions made within the supply chain (Whipple and Russel, 2007).

1.2. The Definition of Supply Chain Collaboration

A variety of definitions of supply chain collaboration have been proposed by different researchers. Narus and Anderson (1996) use the term collaboration to describe cooperation between independent but related companies that share resources and capabilities to meet the needs

of their customers. Barrat and Oliveira (2001) associate effective collaboration with mutual trust between the supply chain partners, openness to new markets, and shared risks and benefits.

Barratt (2004) groups various forms of potential collaboration in supply chain into two main categories: vertical and horizontal (see Fig. 1.1). Both vertical and horizontal collaboration may be implemented internally and externally. External vertical collaboration takes place with customers or suppliers, whereas internal vertical collaboration is realized between functions. External horizontal collaboration may involve competitors or other organizations, and internal horizontal collaboration, like the vertical one, takes place between functions (see Fig. 1.1).

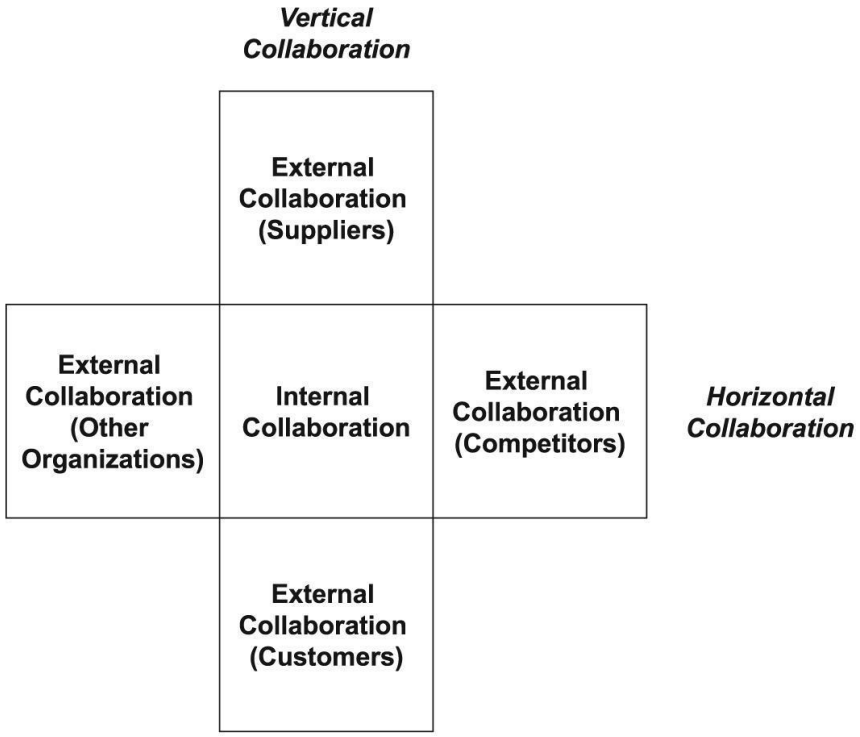

Figure 1 - The scope of collaboration: generally (Barratt, 2004)

Simatupang and Sridharan (2008) consider SCC as two or more independent companies working together on delivering products to end customers in order to create a competitive advantage and optimize profits for all supply chain members. The authors identify commitment and alignment with the strategic goal as vital elements of collaboration between supply chain members, whereas business process management is suggested as the most important one.

A distinct view on the collaborative relationship was proposed by Samaddar and Kadiyala (2006). They describe it as "one in which an organization initiates and implements a knowledge creation endeavor, and a collaborating organization shares the expense and benefits of newly created knowledge, including its joint ownership through patents and licenses".

Collaboration may be represented in various forms, such as strategic alliances, joint ventures, third party logistics, short- and long-term contracts, partnership sourcing, and retailer–

supplier partnerships (Angerhofer and Angelides, 2006). The researchers distinguish three levels of SCC: strategic level, managerial level, and operational level. The strategic level involves decisions that have impact on the long-term development of the collaborative supply chain, such as capital investment or changing the structure of the supply network. The managerial level mainly deals with the optimization of the goods flow that also involves forecasting, planning and controlling resources. At last, the operational level of collaboration comprises routine and regular tasks, for example, production or transportation scheduling and inventory control (Angerhofer and Angelides, 2006).

Whipple and Russel (2007) explore various types of collaboration and identify three of them in their research: collaborative transaction management (Type I), collaborative event management (Type II) and collaborative process management (Type III). According to the authors, Type I is characterized by intensive data exchange and task alignment focused on operational issues/tasks. It encompasses such relationships as scorecard collaboration initiatives and VMI. Compared to Type I, Type II includes decision-making not only at the operational level, but also at the tactical/managerial level. It is characterized by joint planning activities concerning events and items of collaboration (e.g. new product development, promotions). Type III involves a more strategic collaboration based on knowledge sharing and joint decision-making. It is distinguished by joint problem solving, long-term joint business planning, and more fully integrated supply chain processes (e.g. advanced CPFR).

For the purpose of this master thesis, the definition of collaboration provided by Cao and Zhang (2011) will be adopted: “a partnership process where two or more autonomous firms work closely to plan and execute supply chain operations towards common goals and mutual benefits”.

In previous studies the terms cooperation, coordination and integration were sometimes used along with collaboration to describe the same concepts (Matopoulos et al., 2007). However, some researchers state that there is an explicit difference between these three terms and they all have distinct meanings (Kanda and Deshmukh, 2008; Cao and Zhang, 2011). According to Webster (1966), the term integration is defined as “the unified control of a number of successive or similar economic or especially industrial processes formerly carried on independently”. Singh and Power (2009) view cooperation as an exchange of essential information between firms, which have some long-term relations with a great number of suppliers or customers. They consider coordination as a higher level where information technology enables a continuous flow of important information. They also deem collaboration higher than coordination, since it requires a high level of commitment, trust and information sharing. Thus, in this master thesis, the terms collaboration, cooperation, coordination and integration are considered as different concepts.

1.3. Benefits, Enablers and Barriers of Supply Chain Collaboration

Collaboration has been considered as a strategy for effective supply chain management (Min et al., 2005). In this regard, a significant amount of research has focused on investigating the benefits and enablers of successful collaboration strategy.

Barrat and Oliveira (2001) highlight the development of the adequate environment as a crucial requisite for implementing collaborative practices. They suggest that the environment should rely on two major co-dependent concepts: trust and technology. Therefore, the development of IT that supports collaborative initiatives should be aligned with building trust between the supply chain partners in the long term.

Akkermans et al. (2004) demonstrate that supply chain collaboration requires high levels of trust and information transparency, which can be achieved only by a great deal of joint hard work, or "travail" as the authors call it. Once this is accomplished, the supply chain partners trust each other more and share a greater amount of data, which in turn improves their performance and leads to even higher levels of trust and transparency. High levels of trust and information transparency can particularly result in avoiding the bullwhip effect (Lee et al., 2004).

In addition to trust, benefit reciprocity, information exchange, and risk sharing have been suggested as the basis for collaboration (Barratt, 2004). Min et al. (2005) report that successful supply chain collaboration leads to higher levels of efficiency, effectiveness and improved market positions for the firms involved in the supply chain.

The study by Simatupang and Sridharan (2005) also proposes a model for the collaborative supply chain comprising five characteristics: collaborative performance system; information sharing; decision synchronization; incentive alignment; and integrated supply chain processes.

Fawcett et al. (2008) examine three major aspects of supply chain collaboration: SCM driving forces that induce collaboration in the chain, benefits and barriers. The driving forces represent external pressures, such as increased customer demand, technology development, greater competition intensity, globalization, power change in the supply chain,, aligned relationships, etc.). As for the potential benefits of collaboration, the most important among the multitude of them include increased inventory turnover, higher revenue, reduced costs, shorter inventory cycles, reduced order cycles, unique products and services, improved quality, faster R&D cycle times, flexible response to customer, better delivery performance, and enhanced asset management. Unlike many other researchers, Fawcett et al. (2008) focus not only on the benefits and successful outcomes of collaboration, but also on barriers to it, namely: insufficient top management support, non-alignment of operational and strategic policies with the company's philosophy, inability to share information, lack of trust between supply chain partners, unwillingness to share risks and

rewards, and resistance to change. The comprehensive framework developed by the researcher to describe the driving forces, benefits and barriers of collaboration is presented in the Figure 2.

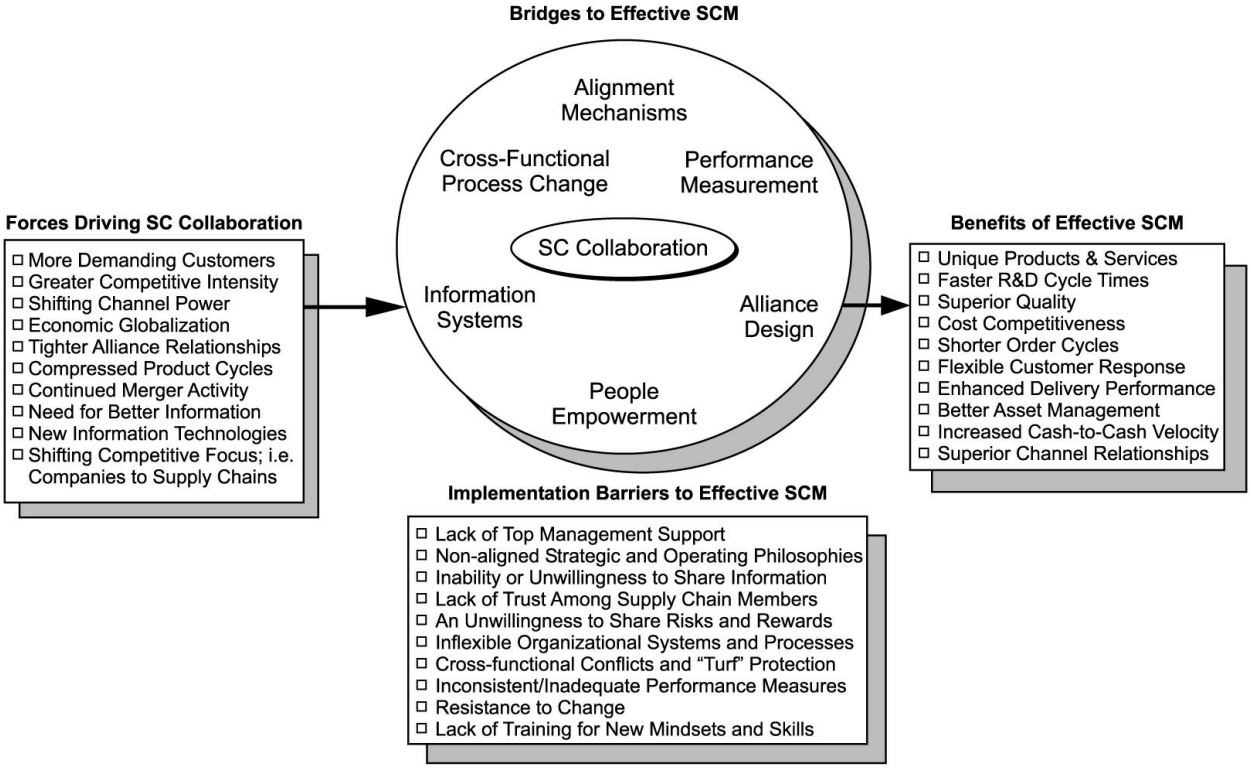

Figure 2 - A contingency framework for understanding supply chain implementation (Fawcett et al., 2008)

According to Nyaga et al. (2010), firms engage in collaborative relationships with their supply chain partners in order to achieve efficiencies, flexibility, and sustainable competitive advantage. Their study showed that collaborative activities, such as information sharing, relationship, joint effort and dedicated investments, result in trust and commitment. Trust and commitment, on their turn, lead to greater satisfaction and improved performance. Based on two independent studies, the researchers discovered that buyers in the supply chain focus more on results associated with relationship, while suppliers seek to protect their investments on specific assets by means of information sharing and joint relationship effort.

Cao et al. (2010) derived a model for effective supply chain collaboration that includes seven dimensions, namely: information sharing, goal congruence, decision synchronization, incentive alignment, resource sharing, collaborative communication, and joint knowledge creation.

The issues of dependency, power and lack of trust have been frequently raised as key factors inhibiting supply chain collaboration (Fawcett et al., 2008; Nyaga et al., 2010; Zeng et al., 2012; Chen et al., 2014; Wu et al., 2014). In their research of manufacturer–retailer collaboration,

Sridharan and Simatupang (2013) determine the different power structures which can be observed in the supply chain and which impede the design of collaborative approaches.

According to Kumar and Banerjee (2014), some of the benefits of supply chain collaboration include higher service levels, increased flexibility, greater satisfaction of end customer, reduced cycle time, as well as dealing with great demand uncertainties.

Ramanathan (2014) investigated environmental factors that favour such collaborative practices in supply chain, as Vendor Managed Inventory, Continuous Replenishment and Collaborative Planning Forecasting and Replenishment, Efficient Consumer Response, and Electronic Data Interchange. The study focused on three factors, namely: number of collaborating partners, the level of investments and the involvement in supply chain processes, and their impact on potential SC benefits. However, the study reveals that investment, number of partners and duration of collaboration, do not independently result in enhanced supply chain performance. The successful collaboration for any company depends on its flexibility to revise the degree of collaboration based on the performance analysis.

According to the research of Scholten and Schilder (2015)[S1], information-sharing, collaborative communication, mutually created knowledge and joint relationship efforts increase the visibility, velocity and flexibility, which eventually leads to the improved supply chain resilience. The study of Qu and Yang (2015), based on data from twenty-four countries, revealed that in countries with higher levels of uncertainty avoidance and social trust, firms may be less willing to engage in a SCC.

Zhou et al. (2017) investigate the potential of group purchasing organizations (GPOs) in assisting information sharing and coordinating horizontal competition in a supply chain consisting of a GPO and manufacturers. By means of the benchmark analysis, the researchers determine the factors of supply chain inefficiency: double marginalization caused by GPO, the manufacturers' horizontal competition and information incompletion in the context of individual purchasing. The authors conclude that, by integrating the different information received from the buyers, the GPO can play the informational role, and thus, reduce information incompletion, coordinate relationships between the buyers, and better administrate contractual mechanisms.

The study by Huang et al. (2017) explores how information sharing influences the reduction of costs and inventory for multiple suppliers in a two-echelon supply chain. The authors revealed that, information sharing has a greater impact on the reduction of suppliers' stock level and costs, as the correlation coefficient on successive demand increases. The research also analyses the effects of the promotion activities initiated by the retailer at every period on demand for the next period. However, the study does not take into account seasonal fluctuations of demand and their effect on the costs and inventory of the suppliers.

1.4. Supply Chain Collaboration Dimensions

Based on previous research by Cao and Zhang (2011) and Dijk (2016), this study adopts the following seven dimensions of collaboration: information sharing, decision synchronization, incentive alignment, resource sharing, collaborative communication, joint knowledge creation and goal congruence. For better understanding, the role of each dimension for collaboration is discussed further. The supply chain collaboration dimensions were derived by previous researchers based on a vast literature synthesis.

Information sharing refers to the extent to which a firm shares relevant, accurate, complete, and confidential information duly with its supply chain partners (Cao and Zhang 2013). Previous studies have indicated that information sharing helps to enhance decision making and supply chain performance (Li et al., 2006; Simatupang and Sridharan, 2008), as well as establish stronger partnerships and closer integration (Du et al., 2012; Khan et al., 2016). The information sharing is reported to improve supply chain resilience through increasing visibility, velocity and flexibility. In this regard, the type of information being shared, the frequency, direction and mode of information sharing are particularly important (Scholten and Schilder, 2015). Fawcett et al. (2011) using the RBV approach found that information sharing culture has a positive effect on organizational performance and customer satisfaction. Prajogo and Olhager (2012) showed in their research of suppliers and manufacturers that information sharing improves logistics integration in inventory management. Hall and Saygin (2012) advocate that the implementation of information sharing should be supported by higher levels of trust, stability and long-term commitments in the supply chain, otherwise the simple data transfer between functions will not be sufficient to improve supply chain performance. Information sharing enables decision synchronization, since timely and accurate information facilitates more effective decision-making across the whole supply chain (Simatupang and Sridharan, 2005).

Decision synchronization was explicitly conceptualized in the study by Simatupang et al. (2002), where the researchers define it as “the extent to which the chain members are able to orchestrate critical decisions at planning and execution levels for optimizing supply chain profitability”. The decision rights and knowledge of supply chain partners about supply chain operations differ, that is why decision synchronization is a vital element of collaboration (Simatupang and Sridharan 2005). Wadhwa and Rao (2003) indicated that improved decision knowledge have a significant impact on supply chain performance. Decision synchronization helps to find out what kind of data are required for decision makers, thereby facilitating information sharing and providing feedback on performance metrics used to make decisions. Moreover, decision synchronization helps to develop appropriate incentive schemes that takes into account

different levels of decision making of each supply chain member. (Simatupang and Sridharan, 2005).

The concept of incentive alignment was also outlined by Simatupang and Sridharan (2002) as “the process of sharing costs, risks, and benefits amongst the supply chain members”. It implies that all gains and losses should be distributed fairly across the supply chain and the collaboration outcome should be beneficial to all supply chain members (Manthou et al. 2004). Thus, incentive alignment is aimed at making firms follow their mutual strategic objectives, provide accurate information and make decisions that are beneficial for the whole supply chain (Simatupang and Sridharan, 2008). Narayanan and Ananth Raman (2004) associate incentive alignment with the performance of the whole supply chain. If the supply chain members lack incentive alignment, their actions will not optimize the performance of the network, resulting in excess inventory, stock-outs, incorrect forecasts, inadequate sales efforts, and poor customer service. The alignment of actions with the common purpose of collaboration improves individual profitability of each partner. Incentive alignment supports decision synchronization by encouraging supply chain members to make effective decisions that ensure the intended level of performance.

Resource sharing is the process of leveraging capabilities and assets and investing in them with supply chain members (Cao and Zhang 2013). Along with information sharing, resource sharing has been widely referred to as a key determinant of effective coordination (Arshinder et al., 2008; Huiskonen and Pirttilä, 2002; Stank et al., 1999). Resource sharing among supply chain partners varies from tangible elements such as sharing of warehouses, machineries and logistical services to intangible elements such as information sharing and reputations (Ramanathan and Gunasekaran 2014). Resource sharing is a critical part of many collaborative relationships (Ireland and Crum, 2005). Supply chain partners can develop critical resources that extend firm boundaries and that may be incorporated in interfirm activities and processes. These resources allow the collaborating firms to gain higher returns and sustainable competitive advantage (Dyer and Singh 1998).

Communication is an important element of any collaborative initiative, no matter in which dimension it is undertaken: internal, external, vertical, or horizontal. The intense and frequent communication in the supply chain enables a better understanding of the organizational goals and objectives (Wagner and Buko, 2005). Clear and comprehensible goals are, in turn, associated with improved coordination between supply chain functions (Hugos, 2011). When the decision-makers cannot access the required information and the functions are not guided by system-wide objectives, the supply chain faces the problem of insufficient coordination (Sahin & Robinson, 2005). Computing and communication technologies have played and will continue to play, an important role in improving design communication (Demirkan, 2005). New technologies have been applied

in order to enhance distributed organizational interactions and achieve good coordination and communication between distributed project teams (Perry and Sanderson, 1998; Wikforss and Lofgren, 2007). Collaborative communication can increase the degree of the interaction and technical collaboration between different partners, making it easier to remove uncertainty and confusion in the early design stage, which cannot be replaced completely by partnering procurement. Collaborative communication has a positive impact on timeliness, understanding, and accuracy.

According to Malhotra et al. (2005), joint knowledge creation can be described as the degree to which supply chain partners develop a better understanding of and response to the market and competitive environment by working together. Essentially, joint knowledge creation is one of the most important objectives of collaboration (Hardy et al. 2003; Gomes and Dahab 2010; Cheung et al. 2011). Supply chain collaboration encourages collective learning for improving supply chain performance, which in turn provides benefits to all partners (Simatupang and Sridharan 2004). Joint knowledge creation, as well as its distribution and shared interpretation allow firms in the supply chain to create new values such as developing new products, building brand image, responding to customers' needs, and establishing channel relationships (Johnson and Sohi 2003; Luo and Pan. 2006; Kaufman et al. 2000). New product development in a high-tech environment requires the merging and integration of different technologies to network strategic communities inside and outside the company in order to share and transfer and thus create knowledge. Knowledge creation acquires expertise from outside the company. In order to create new knowledge, supply chain partners are engaging in interlinked processes that enable rich information sharing, and building information technology infrastructures that allow them to process information obtained from their partners (Malhotra et al., 2005).

Goal congruence is the extent to which supply chain partners perceive their own objectives to be satisfied by the accomplishment of the supply chain objectives (Cao and Zhang, 2013). It is recognized as one of the key elements in the collaborative relationship between supply chain partners (Jap, 2001; Naude and Buttle, 2001). Alignment of goals leads to shared inter-organizational interests and thus assists the collaboration. One of the benefits it provides is the reduction of incentives for opportunism (Lejeune and Yakova 2005). Congruent goals direct buyers and suppliers in the supply chain towards cooperative behaviours, such as constructive communication, mutual support and adaptation, and high commitment (Jap and Anderson, 2003). As a result, goal congruence facilitates synergy in the supply chain and efficient use of resources (Littler et al. 1995). Engaging in networks and supply chain alliances is a means for involved partners to achieve goals that they could not attain independently (Mohr and Spekman, 1994), the partners also bring their own organizational- and individual-level goals of improving their

performance to the process (Schreiner et al., 2009). Goal congruence is a necessary requirement to clear understand and achieve supply chain members' goals and objectives as independent actors of alliance and as a part of the supply network as a whole.

1.5. Supply Chain Collaboration and Firm Performance

As it has already been mentioned, a considerable amount of literature has associated supply chain collaboration with improvements in firm performance. However, there are different perspectives on how to measure the organizational performance, and a great variety of performance measures has been suggested in the supply chain literature. Mehrjerdi (2009) mentions measures related to the inventory cost or lead time as important, but he suggests that they provide a scarce and insufficient perspective in terms of complex supply chain conditions. Several researchers believe that performance measurement in a supply chain needs to be holistic (Bititci et al., 2000; Lambert and Pohlen, 2001). Beamon (1999) divided measures in supply chain management into three categories, namely resources, output and flexibility. Gunasekaran et al. (2001) identified performance measures according to the different levels of decision-making, that is, strategic, tactical and operational measures. De Toni and Tonchia (2001) considered not only financial, but also non-financial measures.

Based on a vast review of literature and cases, Gunasekaran and Kobu (2007) identified 46 different performance measures in a supply chain. Around 50 percent of the suggested performance measures referred to internal business processes (internal view) of a supply chain and the rest 50 percent were related to the customer (external view) of the supply chain. As suggested by Fisher (1997), choosing between the internal and the external view of a supply chain means finding the right balance between operational efficiency and customer responsiveness.

In this study, the term performance is considered twofold: (1) as firm performance that includes such measures as sales growth, satisfaction with collaboration, market share growth, ROI, and consumer satisfaction, and (2) operational performance. Operational performance refers to the ability of a company to reduce management costs, order-time, lead-time, improve the effectiveness of using raw materials and distribution capacity (Heizer et al., 2008). Operational performance plays an important role: it helps to improve effectiveness of production activities and to create high-quality products (Kaynak, 2003), resulting in to increased revenue and profit for firms (Truong et al., 2015). For the purpose of the study, operational performance addresses such parameters as on-time delivery to consumer, order fulfillment lead-time, total logistics costs, inventory turn and stock-outs.

1.6. Collaborative Advantages

Several studies in SCM have attempted to identify empirical evidence of the role of SCC for collaborative advantage (Cao and Zhang 2011; Kanter 1994) and performance (Nyaga et al. 2010; Ramanathan and Gunasekaran 2014; Sheu, et al. 2006; Yu et al. 2013; Zacharia, et al. 2011).

The concept of collaborative advantage was first developed by Kanter (1994) in her article published in Harvard Business Review. The researcher uses the concept to describe the specific advantages that may be gained by firms establishing strategic partnerships with other firms by virtue of such cooperation.

It has been well known that competitive advantage determines firms' profits and performance; however, since recently, the increasing competition has compelled companies to start changing their strategies in order to create joint competitive advantage with their partners (Lavie 2006). Collaborative advantage is a relational view of inter-organisational competitive advantage (Dyer and Singh 1998). In contrast to competitive advantage, which focuses only on the firm's own profit, collaborative advantage seeks to maximise a common profit for joint rent-seeking activities (Lavie 2006). Collaborative advantage cannot be achieved by any firm alone, rather it can be acquired when different firms pursue collaborative action for synergistic outcomes (Vangen and Huxham 2003).

In previous research, it has been asserted that collaborative advantage is a way of improving performance (Sheu et al. 2006; Yu et al. 2013). Jap (2001) discovered that joint competitive advantage has a positive influence on economic outcomes. According to Simatupang and Sridharan (2005), collaborative advantages, obtained through collaborative practices allow the firms to achieve the highest levels of customer services and process standards and make necessary improvements to surmount these levels.

Collaboration is intended to generate customer value by producing mutual advantages among suppliers, manufacturers, and distributors with respect to the supply of low-cost, high-quality products and services. Many of the problems that manufacturing firms face, such as parts shortages, delivery issues, quality problems, and cost increases, are rooted in the lack of effective supply chain integration (Kim, 2009). Supply chain collaboration makes use of shared resources and knowledge (both internal and external to an organization) optimal to achieve operating synergy and efficiencies, reduce costs, and enhance profits (Stock et al., 2010). It also allows firms to take advantage of different specialized capabilities through intensive coordination, which allows for the accumulation of economies of scale in production, purchasing, logistics, and problem solving. Supply chain collaboration systematically synchronizes the resources and capabilities of every supply chain participant to enhance service performance, lower total costs, develop innovation etc. All of this allows to predict a direct connection between dimensions of supply

chain collaboration and collaborative advantages. Moreover, the links between collaborative advantage, firm performance and operational performance are also expected to be significant. Hence, collaborative advantage is expected to have a mediating role and enhance the effect of supply chain collaboration dimensions on firm performance and operational performance. The level of impact of dimensions on collaborative advantages and firm performance and operational performance will be estimated further.

1.7. Distribution Network Structure and Specific Features

Despite potential benefits, supply chain collaboration encounters many challenges including partner search and selection. Distribution has been recognized as one of the key drivers of the overall firm profitability, since it has a direct effect on both the supply chain costs and the customer experience. Distribution refers to the steps taken to move and store products from the supplier stage to a customer stage in the supply chain. Good distribution can be used to achieve a variety of supply chain objectives ranging from low cost to high responsiveness. As a result, companies in the same industry often select different distribution networks with similar and comparable structure (Chopra and Meindl, 2013).

Most distribution networks have a network supply chain structure, which is a complex supply chain with a combination of divergent and convergent structures. The different types of supply chain structures include serial, dyadic, divergent, convergent, and network structures. The serial structure is a typical one involving suppliers, manufacturers, distributors and retailers. This structure is the result of cascading several dyadic structures. The dyadic structure consists of two business entities. A divergent structure is used to represent a more realistic supply chain in which one entity (e.g. supplier) distributes stock to several downstream entities. In a convergent structure, several entities (e.g. several suppliers) deliver components to a single manufacturer or to a distribution center (Montoya-Torres and Ortiz-Vargas, 2014). An example of the network supply chain structure is depicted in Figure 1.

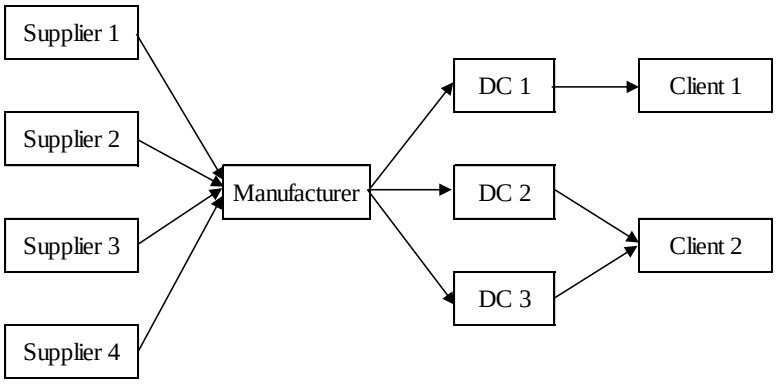

Figure 3. Example of network supply chain structure

Source: Montoya-Torres and Ortiz-Vargas (2014)

Many papers on distribution networks focus mainly on classifying the mathematical models. Vidal and Goetschalckx (1997) examined the mixed-integer programming models for strategic production-distribution network design and determined the main features of them. Beamon (1998) considered different mathematical modeling approaches with the focus on four types of models based on the nature of the inputs and the objectives. In addition, the number of articles considered in these previous reviews was limited. Here, we focus on the distribution network design, namely on the downstream supply chain (i.e. from manufacturer to customers), and the flow from up to downstream. Figure 2 presents an example of a distribution network, which is the most relevant for this research.

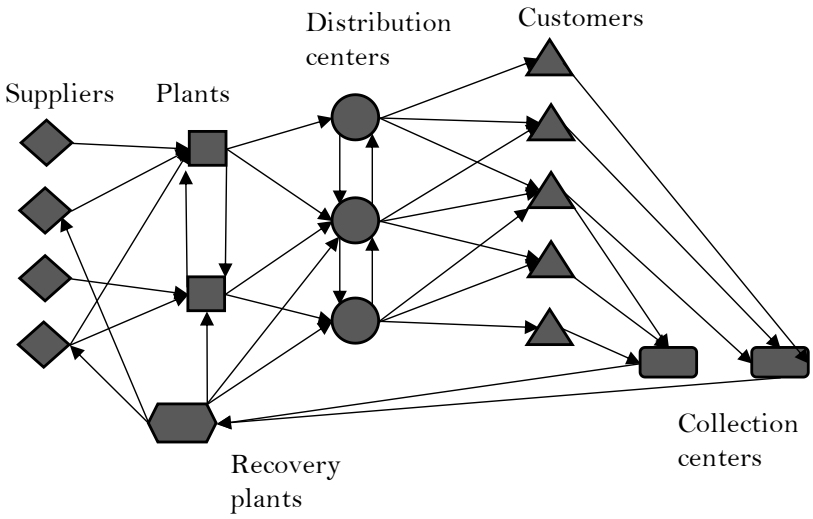

Figure 4. Example of distribution network structure

Source: Mangiaracina, Song and Perego (2015)

In the considered distribution network, the part of the network structure that consists of relationships between suppliers and a distributor, is examined. An important feature of this structure is the existence of decision-making firm related to the distributor organization, which, in fact, has a role of a 3PL operator in terms of supply chain management.

This study focuses on the SCN design of a two-echelon supply chain, that involves more than 600 suppliers and 8 distribution centers located in different regions of Russia, and a distribution decision-making center (headquarter of distribution firm – focal firm). The reason for the limitation of our research by the two-echelon supply chain is the focus on the upstream relationships between suppliers (manufacturers mostly) and distributor.

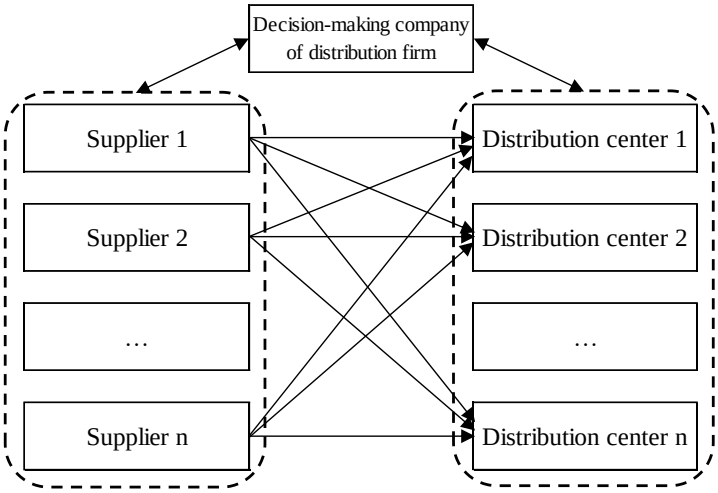

Figure 5. Considered part of supply chain distribution network

Source: partially adapted from Montoya-Torres and Ortiz-Vargas (2014)

Figure 3 depicts a part of distribution network structure with decision-making center. The material flow is directed from suppliers to distribution centers as depicted in Figure 1. The information flow is directed from DCs to DMC and from DMC to suppliers and then back. Thus, each link starting from a manufacturer, passing through a distribution center, and ending at a retailer can be regarded as a potential transportation route. The majority of decisions related to the development strategy, contract system, location of distribution centers, building and equipment of warehouses, information integrated processes and other belong to the managing company, while operational management is related to the regional departments (distribution centers).

Analysis of previous research in the field of Supply Chain Management revealed that there is a major research gap regarding the implications of SCC on the firms' performance. The purpose of this master thesis is to provide theoretical insights and empirical findings on the effects of SCC on the performance of firms as in the example of the supply chain of a Russian distributor and its suppliers. For the purpose of this research, the explanatory and deductive approach will be used, quantitative data will be collected by means of a web-based survey questionnaire. As the result, a theoretical model will be developed and empirically tested.

2. HYPOTHESES DEVELOPMENT AND METHODOLOGY

2.1. Conceptual Framework and Hypotheses Development

The principal constructs of the supply chain collaboration were derived from the theoretical background and further used to develop the theoretical, measurement and structural models of this thesis. The constructs include supply chain collaboration dimensions (SCCD), collaborative advantage (CA), operational performance (OP), and firm performance (FP). To address the research issues, seven basic and important elements of collaboration and its underlying structure were identified with the help of the existing related literature (Cao and Zhang, 2011; van Dijk, 2016). Thus, the construct SCCD included 7 items, namely: information sharing, decision synchronization, incentive alignment, resource sharing, collaborative communication, joint knowledge creation and goal congruence. The latent construct CA consisted of 4 items: offering flexibility, process efficiency, innovation and business synergy. To recap, the measurements for the latent construct OP were developed in the theoretical review and included 5 items: on-time delivery to consumer, order fulfillment lead-time, total logistics costs, inventory turn and stock-outs. Finally, for the latent construct FP 5 measures were adopted from theoretical background, namely: sales growth, satisfaction with collaboration, market share growth, ROI, and consumer satisfaction. The dimensions of SCC are expected to have a positive impact on operational performance and firm performance. The direct relationships between these constructs may be mediated through collaborative advantage.

According to Cao and Zhang (2011), by collaborating, supply chain partners can work as if they were a part of a single enterprise. They can access and leverage each other's resources and enjoy their associated benefits. Such collaboration can increase collaborative advantage and enhance firm performance and operational performance. Thus, the following hypotheses underlying the research of this master thesis can be formulated.

Supply chain collaboration dimensions:

H1a: Supply chain collaboration dimensions have a significant positive direct effect on operational performance;

H1b: Supply chain collaboration dimensions have a significant positive direct effect on firm performance;

H1c: Supply chain collaboration dimensions positively impact collaborative advantage at a significant level.

Collaborative advantage:

H2a: Collaborative advantage has a direct significant impact on operational performance;

H2b: Collaborative advantage has a direct positive significant influence on firm performance;

H2c: Collaborative advantage positively mediates the positive relationship between supply chain collaboration dimensions and operational performance;

H2d: Collaborative advantage positively mediates the positive relationship between supply chain collaboration dimensions and firm performance.

Operational performance:

H3: Operational performance has a direct positive significant impact on firm performance.

Figure 4 depicts the conceptual supply chain collaboration hypotheses framework used in this research.

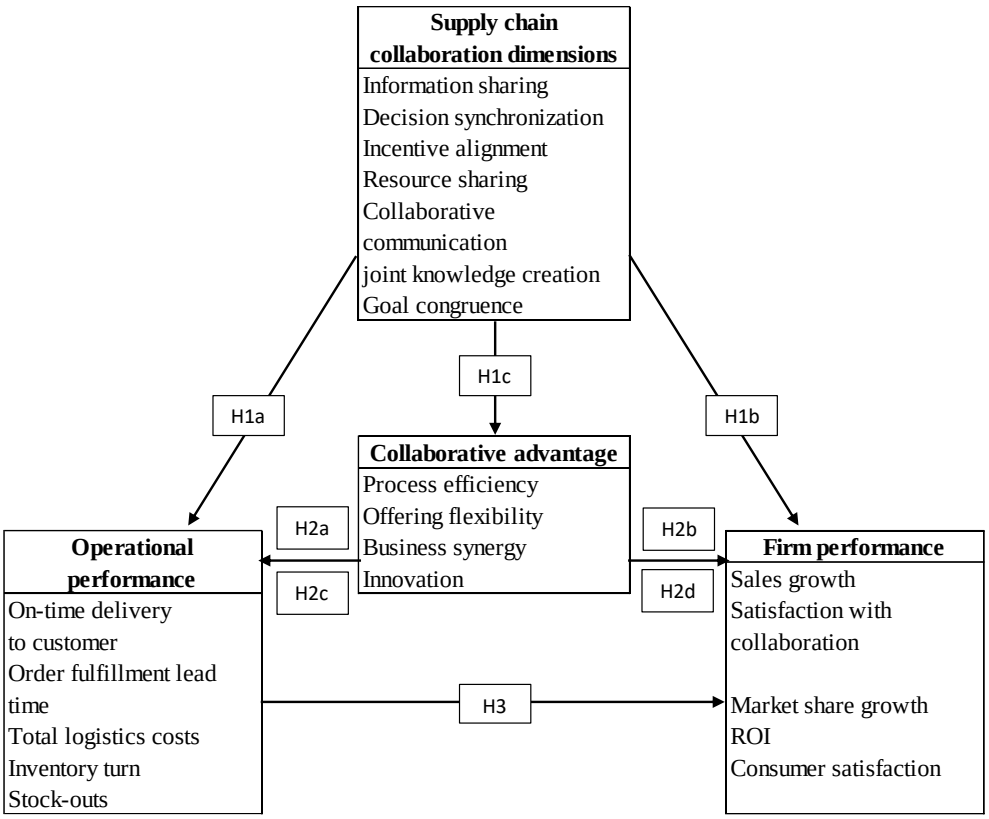

Fig. 6. Conceptual hypotheses framework of supply chain collaboration

Source: partially adapted from Cao and Zhang (2011) and van Dijk (2016)

The developed conceptual supply chain collaboration framework suggests that supply chain members need to embrace supply chain collaboration dimensions and to conduct and practice the dimensions properly. The properly practiced supply chain collaboration dimensions are expected to result in collaborative advantages, which in turn are suggested to have a positive effect on operational performance and firm performance.

2.2. Methodology

Methodology refers to the overall approach to the research process, from the theoretical foundation to the data collection and analysis (Hussey and Hussey, 1997). There are several types of research approaches used in supply chain management. Each of them is appropriate for different types of research questions, and, consequently, should be selected based on the type of the research questions used in the study (Bryman and Bell, 2011).

In line with the master thesis purpose and the research questions, the explanatory type of research was chosen. Explanatory studies are those which establish causal relationships between variables. The main point here is to study a situation or a problem in order to explain the relationships between variables (Saunders et al., 2009).

The research conducted in this thesis can be characterized as deductive. According to Hussey and Hussey (1997), the important characteristics of deductive research include the development of a conceptual and theoretical structure which is then tested by empirical observation, allowing to deduce particular conclusions from the general inferences. In this master thesis a theoretical and conceptual framework of SCC constructs, dimensions and indicators will be developed and tested empirically.

The research presented in this master thesis is of quantitative nature. As a strategy of enquiry for the quantitative approach, Creswell (2003) suggests surveys and experiments. The survey method was chosen for this study, since it primarily tests existing theories, rather than investigating new and emerging areas, where a case study method would be relevant (Yin, 2014). Compared to other methods, such as case studies or experiment, the survey approach has other distinctive characteristics. Firstly, the data are collected by asking people in a structured manner. Collection methods in a survey approach include web questionnaires, mailed questionnaires, interviews. Secondly, a survey approach is a quantitative method that requires standardized information about the researched subject, e.g. individuals, groups or organisations. Thirdly, data are usually collected from a sample, which is a proportion of a specific population (Pinsonneault & Kraemer, 1993; Malhotra & Grover, 1998). In this master thesis the appropriate method of collecting data is a web questionnaire.

The further data analysis suggests several steps. First, descriptive statistics of individual items will be used to assess the overall profile of the respondent group and the activities these companies undertake to achieve supply chain collaboration. Afterwards, the results of the questionnaire will be processed through inferential statistics, Pearson correlation, linear and multiple regression and confirmatory factor analysis (CFA) and structural equation modeling (SEM).

In order to test the conceptual supply chain collaboration framework, the two-step approach was used for assessing the Structural Equation Modelling (SEM) (Anderson and Gerbig, 1988). Analyzing research data and interpreting results can be complex and confusing. Traditional statistical approaches to data analysis specify default models, assume measurement occurs without error, and are somewhat inflexible. However, structural equation modeling requires specification of a model based on theory and research, it is a multivariate technique incorporating measured variables and latent constructs, and explicitly specifies measurement error. A model (diagram) allows for specification of relationships between variables. Moreover, a two-step approach has a number of comparative strengths that allow meaningful inferences to be made. First, it allows tests of the significance for all pattern coefficients. Then, the two-step approach allows an assessment of whether any structural model would give an acceptable fit. Third, one can make an asymptotically independent test of the substantive or theoretical model of interest. Moreover, other statistical techniques, such as multiple regression, factor analysis, multivariate analysis of variance, etc. have a common limitation: they can examine only a single relationship at a time. Thus, first, the fit of the developed conceptual model was examined. Hereinafter, the hypotheses about the relationships presented in the conceptual supply chain framework were tested. (Hair, 2009).

2.3. Study Design and Data Collection

To validate the research model with the data, a survey questionnaire with measurement items derived from the previous research (van Dijk, 2016; Cao and Zhang, 2011) was adopted. The setting of this study views SCC as internally and externally focused functional areas. The relevant literature was reviewed and then relevant items for relevant constructs were obtained. The items were then discussed by experts (operations, marketing, collaborative communications and information sharing) and practitioners. Such procedures intended to ensure face validity and content validity. For the purpose of this research, a five-point Likert scale was adopted, where 1 and 5 were “strongly disagree” and “strongly agree”, respectively. The survey incorporated multiple items for each of the constructs. Most of these items were developed or adopted from available SCC or SCM literature.

The instrument included 19 questions that evaluated the impact of supply chain collaboration constructs and their indicators on performance of suppliers involved in the distribution network. The first four questions were demographic in nature and evaluated the organization profile. Questions 5 to 10 deal with the data on the collaborative relationships that suppliers have with their distributor. The third section of the questionnaire (questions 11 to 17) examined the SCC development and its impact on organizational performance, including three

open questions asking respondents to share their views on the potential areas of improvement in collaboration. Questions 18-19 in the final section aimed at investigating the SCC barriers and impediments that foreign suppliers face, however, due to aforementioned reasons, these indicators were excluded from the research. The questionnaire was prepared in Russian and English versions. The Russian version was sent out to the respondents and the English version was used in the research for the purpose of language uniformity.

The survey aimed to measure the level of practice of various construct items and targeted a single industry to ensure deep understanding. The questionnaire was initially subjected to review by researchers and practitioners in the area of supply chain management. After the instrument was approved, the primary data were collected using the service Google Forms. The survey link was mailed via email to 632 small, medium and large sized suppliers of the distribution network described above. Respondents were asked to fill in the questionnaire, if they had SCC experience. This limitation is allowed when the subject under study is not a usual practice, and the purpose is to get as many responses as possible.

Contacts were obtained from the distributor, and emailing was organized through the decision-making distributor company. It provides direct connection with distributor's business partners. Survey descriptions/extra information, motivations for respondents and the request to forward the email to another person who has more experience in SCC were highlighted. With a response time of five weeks, a total of 65 online responses were received of which 4 had excessive missing values, yielding 61 (9.7 per cent) usable responses. As the subject under study is not a usual practice, the response rate is considered acceptable and is also consistent with similar other studies (Cao and Zhang, 2011; van Dijk, 2016). The summary of the respondents who participated in the survey is shown in Table 1. Among large companies that participated in the survey there are firms related to six different industries, most of them are manufacturers.

Sample descriptive statistics. The descriptive statistics of the sample is provided to assess the overall profile of the respondent group and get better understanding of the supply chain considered in this research. For the purpose of the study, IBM SPSS Statistics 24 software was used to calculate descriptive statistics.

Almost all firms in the sample operate in the Russian Federation (98.4%), only one firm operates in Italy. The reason for such situation is increasing prices for imported products, reduction of foreign trade activity and, thus, the offset of supplier selection priorities in the Russian market.

Table 1. Distribution of the respondents in different industries

Industry	Number of companies	50-100 FTEs	101-250 FTEs	251-500 FTEs	501-1000 FTEs	More than 1000 FTEs
Cable production	6	-	3	1	1	1
Industrial electrical equipment	17	10	2	2	1	2
Lighting products	1	-	1	-	-	-
Installation electrical equipment	17	7	1	6	1	2
Fasteners and plumbing	5	-	2	2	1	-
Safety systems	15	10	2	1	-	2

The majority of respondents are concentrated in three industries: Industrial electrical equipment (27.87%), Installation electrical equipment (27.87%), and Safety systems (24.59%). The results of the distribution of respondents by industry composition in both frequencies and percentages are presented in table 2.

Table 2. Descriptive statistics by industry composition

Industry description	N	(%)
Cable production	6	9.84%
Fasteners and plumbing	5	8.20%
Industrial electrical equipment	17	27.87%
Installation electrical equipment	17	27.87%
Lighting products	1	1.64%
Safety systems	15	24.59%

Of all respondents, 27 (44.3%) reported that their firm has between 50-100 full-time employees (FTEs), 11 (18%) respondents declared to have 101-250 FTEs. Slightly more, 12 (19.7%) respondents stated that they have 251-500 FTEs. A smaller number of respondents

reported to have 501-1000 and more than 1000 FTEs, 4 (6.6%) and 7 (11.5%), correspondently. Thus, we can conclude that the majority of respondents represent small and medium enterprises.

The majority of respondents, 36 (59.0%) have long-term relationships with their distributor, that is, for more than 5 years, 21 (34.4%) respondents have reported to have a relationship with their distributor for 1-5 years, and only 4 respondents indicated that the relationship with their distributor has been lasting for less than one year, this group of respondents related to Fasteners and Plumbing industry, which represent a new direction of development of the focal company.

As for the type of relationship strategy in the supply chain, most of the respondents (86.9%) stated to maintain cooperative relationship with their distributor. The distribution of respondent firms according to the relationship strategy with their distributor is presented in table 3.

Table 3. Type of supply chain relationship strategy

Type of supply chain relationship strategy	**N**	**(%)**
Cooperative	53	86.9%
Competitive	6	9.8%
Command	2	3.3%

The long-term relationship between partners facilitate a high level of cooperation and, therefore, lead to the cooperative type of supply chain strategy. Another reason why most respondents reported the cooperative type of supply chain strategy is that all of them are partners of the single distributor and, hence, perceive the relationship within the network as a priori cooperative, rather than competitive or command. To support this, the cross-table of type of supply chain relationship strategy and relationship length is provided below.

Table 4. Cross-table of type of supply chain relationship strategy and relationship length

Strategy/length	**<1 year**	**1-5 years**	**More than 5 years**
Cooperative	3 (4.9%)	18 (29.5%)	32 (52.5%)
Competitive	1 (1.6%)	2 (3.3%)	3 (4.9%)
Command	0 (0.0%)	1 (1.6%)	1 (1.6%)

3. ANALYSIS OF MODELING RESULTS

3.1. Correlation and Regression Analysis of Depth and Scope of Collaboration

Following van Dijk (2016), the depth and scope of collaboration were assessed by means of the construct collaboration areas. While the scope of collaboration is measured by the number of business processes and activities in collaboration, the depth of collaboration represents the level and degree of integration of processes in collaboration, and it increases with the volume and frequency of material and information exchanges and the employed coordination mechanisms (Skjoett-Larsen et al., 2003). For the purpose of the study, IBM SPSS Statistics 24 and IBM SPSS Amos 24 were used to conduct data analysis.

In our research, we asked the respondents to evaluate the extent of collaboration in several areas, the results are presented in table 5.

Table 5. Descriptive statistics of collaboration areas

Collaboration area	Min	Max	Mean	SD
Production	1	5	1.85 (Little involvement)	1.263
Inventory management	1	5	2.95 (Some involvement)	1.371
Distribution	1	5	2.90 (Some involvement)	1.411
R&D	1	5	1.48 (No involvement)	0.942
Supply chain design	1	5	2.69 (Some involvement)	1.444
Product development	1	5	1.69 (Little involvement)	1.148
Promotion	1	5	4.02 (Great involvement)	1.008

The means of involvement in most collaboration areas were lower than the scales mid-point (3). Thus, it can be inferred that the respondents perceived a low level and degree of collaboration in most collaboration areas. The only collaboration area which had a larger mean (4.02) than the mid-point (3) was promotion. Hence, the respondents perceive to have the highest level of collaboration with their distributor in the area of promotion. The lowest level of collaboration was assigned by the respondents to the area of R&D with the mean value of 1.48. It is followed then by product development and production areas with means of 1.69 and 1.85 respectively. A higher degree of collaboration is perceived to be in the areas of supply chain design, distribution and inventory management, which all have means close to the mid-point (3).

The correlations between collaboration areas and operational and firm performance indicators were calculated to examine the relationship between these independent and dependent variables. The results of the Pearson correlation are presented in table 6.

Table 6. Correlation between collaboration areas and firm performance and operational performance indicators

Dependent/Independent	Production	Inventory Management	Distribution	R&D	Supply Chain Design	Product Development	Promotion
Sales growth	.138	.215	.279*	.104	.128	.182	.210
Satisfaction with collaboration	.181	.324**	.334**	.268*	.095	.302*	.228
Market share growth	.038	.270*	.213	.002	.016	.116	.144
ROI	.025	.245	.200	.179	.126	.120	.140
Consumer satisfaction	.200	.319**	.370**	.232	.178	.334**	.272*
On-time delivery to consumer	.377**	.200	.354**	.199	.246	.353**	.295*
Order fulfillment lead time	.427**	.292*	.446**	.326*	.287*	.436**	.235
Total logistics costs	.009	.154	.197	.035	.165	-.010	.033
Inventory turn	.303*	.417**	.410**	.143	.261*	.240	.065
Stock-outs	.190	.247	.205	.133	.247	.050	.156

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Statistically significant correlations were observed in all collaboration areas and were found to be positive. Collaboration in production resulted in moderate significant correlation with on-time delivery to consumer (.377**), order fulfillment lead time (.427**) and inventory turn (.303*). Collaboration in inventory management led to moderate significant correlation with satisfaction with collaboration (.324**), consumer satisfaction (.319**), and inventory turn (.417**), and showed weak correlation with market share growth (.270*) and order fulfillment lead time (.292*). Next, collaboration in distribution had moderate significant correlation with satisfaction with collaboration (.334**), consumer satisfaction (.370**), on-time delivery to consumer (.354**), order fulfillment lead time (.446**) and inventory turn (.410**), weak significant correlation with sales growth (.279*). Besides that, collaboration in R&D led to weak significant correlation with satisfaction with collaboration (.268*) and order fulfillment lead time (.326*). Collaboration in supply chain design showed weak significant correlation with order fulfillment lead time (.287*) and inventory turn (.261*). Also, collaboration in product development resulted in moderate significant correlation with consumer satisfaction (.334**), on-time delivery to consumer (.353**) and order fulfillment lead time (.436**) and weak significant correlation with satisfaction with collaboration (.302*). Finally, collaboration in promotion demonstrated weak significant correlation with consumer satisfaction (.272*) and on-time delivery to consumer (.295*). No significant correlations were found in the dependent firm performance variable ROI and operational performance variables total logistics costs and stock-outs.

By summing up collaboration areas, operational performance and firm performance, and thereby obtaining the composite variables, the correlation between these composite variables was analyzed. The composite variable collaboration areas had a moderate significant correlation with the composite variable of operational and firm performance (.426**).

In order to gain a more detailed insight into the effects of collaboration areas on operational and firm performance indicators, we performed multiple regressions. Following van Dijk (2016) and Bagchi et al. (2005), the cut-off value for adjusted R square was set on .10. To avoid the multicollinearity issue, the variation inflation factor (VIF) of the collaboration areas, operational performance and firm performance variables was assessed. VIF between 5 and 10 may be a reason for concern, whereas VIF above 10 indicates high correlation that leads to the multicollinearity problem. Most VIFs were in the range between 1.228 and 4.234, only the area of product development had the VIF value 5.457. Nevertheless, all VIF values were well below the maximum acceptable cut-off value of 10, which indicates the absence of multicollinearity. The results of multiple regression of collaboration areas as independent and firm performance as dependent variables are presented in the table 7.

Table 7. Multiple regressions of collaboration areas and firm performance

Firm performance variables	**Collaboration area variables**	**Regressions parameter estimate (Beta)**	**Adjusted R square**
Satisfaction with collaboration	Inventory management*	.350	.176
Satisfaction with collaboration	Supply chain design*	-.371	.176
Satisfaction with collaboration	Promotion*	.362	.176
Market share growth	Inventory management*	.429	.121
Market share growth	Promotion*	.340	.121
Consumer satisfaction	Promotion*	.348	.192

*. $P < 0.05$

The results of the multiple regression analysis show that the firm performance variable satisfaction with collaboration was significantly correlated with the collaboration areas inventory management, supply chain design and promotion. It is interesting to note that in the case of the relationship between supply chain design and satisfaction with collaboration, the regression parameter was negative. As we have information that in most cases all supplies are organized by distributor on the terms of Ex Works and the transfer of ownership of the goods is carried out in the supplier's warehouse, design of supply chain does not take place in fact. Thus, we can assume that most respondents do not have any joint practices with their distributor in supply chain design.

We can suggest that collaboration in inventory management and promotion between suppliers and their distributor is particularly valuable and effective, thus it leads to suppliers' satisfaction with collaboration itself. The multiple regression analysis also showed that market share growth was significantly correlated with the collaboration areas inventory management and promotion. Finally, collaboration in the area of promotion had a significant correlation with consumer satisfaction. The logic of this correlation is quite clear: distributor has a great experience in the area of promotion and the opportunity to use best practices in the market, which results in consumer satisfaction.

However, by summing the collaboration area variables and firm performance variables, the composite variables were obtained and used to run a linear regression analysis between them. The

composite variable collaboration area had a non-significant positive parameter estimate with the composite variable firm performance (.307). Moreover, the adjusted R square was lower than the threshold value of .10, namely, .079.

No significant regressions between collaboration areas as independent variables and operational performance indicators as dependent variables were observed as the result of multiple regression analysis. Nevertheless, by summing the collaboration area variables and operational performance variables, the composite variables were obtained and a simple linear regression analysis was run between them. The same as with the Pearson correlation analysis, the sum of collaboration area variables had a significant parameter estimate with the sum of operational performance variables (.445**). Furthermore, the adjusted R square was higher than the cut-off value of .10, namely .185. Thus, it can be stated that there is indeed a positive relationship of the scope and depth of collaboration with operational performance.

The results of multiple regression of operational performance as independent and firm performance indicators as dependent variables are presented in the table below.

Table 8. Multiple regressions of operational performance and firm performance

Firm performance variables	**Operational performance variables***	**Regressions parameter estimate (Beta)**	**Adjusted R square**
Sales growth	Inventory turn*	.408	.165
Satisfaction with collaboration	Inventory turn*	.337	.175
Market share growth	Inventory turn***	.603	.240
ROI	Total logistics costs**	.381	.278
Consumer satisfaction	Inventory turn*	.315	.206

***. P < 0.001, **. P < 0.01, *. P < 0.05

Analysis of multiple regression of operational performance variables on firm performance indicators showed significant regression between operational performance indicator inventory turn and firm performance indicators sales growth, satisfaction with collaboration, market share growth and consumer satisfaction. Besides that, significant regression was observed between operational performance indicator total logistics costs and firm performance variable ROI. Moreover, by summing the operational performance variables and firm performance variables, the composite variables were obtained and used to run a simple linear regression analysis between them. The

composite variable operational performance had a significant positive effect on the composite variable firm performance (.550***). In addition, the adjusted R square was higher than the cut-off value of .10, namely .290. Thus, it can be stated that there is indeed a positive relationship between operational performance and firm performance.

To provide an integrative and comprehensive analysis of collaboration areas, a path diagram of the multiple regressions was constructed. The results of the multiple regression analysis are represented in the path diagram included in Appendix 1. Table 9 on the next page shows standardized regression coefficients and their significance.

Table 9. Standardized regression coefficients and their significance

Relationship			**Regression parameter estimate (Beta)**	**P-value**
Collaboration areas	→	Operational performance	.521*	.011
Operational performance	→	Firm performance	.416*	.011
Collaboration areas	→	Firm performance	.081	.611
Collaboration areas	→	Product development	.825**	.002
Collaboration areas	→	Supply chain design	.652***	***
Collaboration areas	→	R&D	.710**	.003
Collaboration areas	→	Distribution	.670**	.004
Collaboration areas	→	Inventory management	.627*	.010
Collaboration areas	→	Production	.883**	.002
Collaboration areas	→	Promotion	.413	
Firm performance	→	Sales	.715	
Firm performance	→	Satisfaction with collaboration	.933***	***
Firm performance	→	Market share	.747***	***
Firm performance	→	ROI	.628***	***
Firm performance	→	Consumer satisfaction	.779***	***
Operational performance	→	On-time delivery	.856	
Operational performance	→	Order fulfillment lead time	.966***	***
Operational performance	→	Total logistics costs	.386**	.002
Operational performance	→	Inventory turn	.546***	***
Operational performance	→	Stock-outs	.121	.366

***. $P < 0.001$, **. $P < 0.01$, *. $P < 0.05$

The independent variables of all collaboration areas were represented by one latent construct named “collaboration areas”. The latent constructs operational performance and firm

performance were identified as dependent variables. The table above and the path diagram show that there is a positive significant relationship between the latent construct collaboration areas and the latent construct operational performance (.521*). Moreover, there is a significant positive effect between the latent construct operational performance and the latent construct firm performance (.416*). However, there is no significant effect between the latent construct collaboration areas and firm performance.

To sum up, the scope and depth of collaboration between the suppliers and their distributor in this study can be evaluated as moderate. The results of multiple regression analysis showed that collaboration in the areas of inventory management, supply chain design and promotion had the most positive significant effect on several firm performance indicators, namely: satisfaction with collaboration, consumer satisfaction and market share growth. However, in other collaboration areas, that is, production, distribution, R&D, and product development no significant results from collaboration were observed.

In addition, the relationships between the composite variables of collaboration areas, operational performance and firm performance were analyzed. As a result of the regression analysis, a positive significant effect (.445**) of collaboration areas on operational performance was observed. Moreover, operational performance had a significant positive relationship with firm performance (.550***). To explain such results, we should understand that the term collaboration implies involving active engagement in the solution of operational issues. Coordination of strategic issues only without operational cooperation is not enough for satisfied results. In this case, operational performance influences firm performance.

The abovementioned significant positive effects and relationships were also supported by the path diagram of collaboration areas that is attached in Appendix 1. The structural model measured the relationship between the unobserved latent constructs collaboration areas and operational performance (.521*), collaboration areas and firm performance (.081), and operational performance and firm performance (.416*). Thus, it can be inferred that if the latent construct collaboration increases by one standard deviation, the latent construct operational performance increases by a standard deviation of .521 at the 5 percent level of significance. Thus, a higher level of collaboration has a significant positive impact on operational performance. Moreover, if the latent construct operational performance increases by one standard deviation, the latent construct firm performance increases by a standard deviation of .416 at the 5 percent level of significance.

3.2. Descriptive statistics of the Latent Constructs of the Structural Equation Model

Before presenting the results of Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM), we provide descriptive and inferential statistics of the latent construct

Supply Chain Collaboration Dimensions (SCCD) in table 10 and the latent construct Collaborative Advantage (CA) in table 11.

Table 10. Descriptive statistics of dimensions of supply chain collaboration

Dimension	**Min**	**Max**	**Mean**	**SD**
Information sharing	1	5	4.10	0.926
Decision synchronization	1	5	3.57	1.258
Incentive alignment	1	5	3.16	1.344
Resource sharing	1	5	2.92	1.441
Collaborative Communication	2	5	4.36	0.817
Joint knowledge creation	1	5	2.90	1.350
Goal congruence	1	5	3.56	1.245

As it is shown in table 10, among the most used dimensions of collaboration, collaborative communication (4.36) and information sharing (4.10) had the highest means, also decision synchronization (3.57) and goal congruence (3.56) were used to some extent, whereas resource sharing (2.92) and joint knowledge (2.90) were perceived as the least used collaboration dimensions in the supply chain.

Table 11. Descriptive statistics of collaborative advantages

Collaborative advantage	**Min**	**Max**	**Mean**	**SD**
Process efficiency	1	5	3.48	0.868
Offering flexibility	1	5	3.85	0.910
Business synergy	1	5	3.48	0.906
Innovation	1	5	2.97	1.064

The descriptive statistics in table 11 shows that flexibility (3.85) was evaluated by respondents as the most important advantage derived from collaboration in the supply chain. Such

collaborative advantages as business synergy (3.48) and process efficiency (3.48) were evaluated equally by respondents, while innovation (2.97) was ranked as the least important advantage.

For better understanding of the supply chain collaboration effect, respondents were asked to rate performance improvements due to collaboration in ten specific areas using a five-point Likert scale. The results are presented in table 12.

Table 12. Descriptive statistics of firm performance and operational performance

Firm and operational performance	**Min**	**Max**	**Mean**	**SD**
Firm performance				
Sales growth	2	5	4.34 (Agree)	0.680
Satisfaction with collaboration	3	5	4.30 (Agree)	0.558
Market share growth	2	5	4.07 (Agree)	0.910
ROI	2	5	3.49 (Neutral)	0.766
Consumer satisfaction	3	5	4.11 (Agree)	0.661
Operational performance				
On-time delivery to consumer	2	5	4.02 (Agree)	0.671
Order fulfillment lead time	2	5	3.92 (Agree)	0.781
Total logistics costs	2	5	3.39 (Neutral)	0.802
Inventory turn	1	5	3.77 (Agree)	0.824
Stock-outs	1	5	3.07 (Neutral)	0.946

As for the operational performance and firm performance, the means are generally around the point 4 (Agree). Hence, we can conclude that most respondents perceived a positive change in operational and firm performance resulting from collaboration. Two operational performance indicators, total logistics costs and stock-outs have lower means, which are closer to the mid-point 3 (Neutral). Thus, the respondents perceive almost no effect of collaboration on their total logistics costs and stock-outs. Four indicators have the highest means among all performance indicators, namely: sales growth (4.34), satisfaction with collaboration (4.3), consumer satisfaction (4.11),

market share growth (4.07) and on-time delivery to consumer (4.02). These indicators were perceived by respondents to have achieved the highest improvement through collaboration.

3.3. Confirmatory Factor Analysis

This research follows a two-step SEM approach. The first step in this approach requires to develop and assess the measurement model, whereas the second step requires to specify and assess the structural model (Hair, 2010). Confirmatory factor analysis (CFA) is a multivariate statistical procedure, which corresponds to the measurement model. It is a theory-driven statistical method, employed to test predefined hypotheses. All latent constructs and indicators were determined in advance and presented in the conceptual framework, therefore, confirmatory factor analysis (CFA) was used to evaluate the measurement model fit and validity. After the measurement model was proved to adequately represent theory with the data obtained for the study, structural equation modeling was used to analyze the hypothesized relationships between constructs. All statistical analyses were completed in IBM SPSS 24 and IBM SPSS Amos 24. The level of significance for all tests was set at 0.05 level.

Following Van Dijk (2016), we decided to conduct a preliminary test of construct reliability analyzing each of the constructs apart from the other ones. From the point of view of statistics, reliability is explained as the proportion of inconsistent observations due to individual differences in respondents. This means that even a reliable survey will have varying responses due to the fact that respondents have different opinions on questions, not because of the fact that the questionnaire questions were unclear or ambiguous. Consequently, a test for reliability was conducted for all four latent constructs.

The preliminary reliability analysis was run using Cronbach's alpha coefficient. It indicates that all latent constructs taken separately, disregarding possible correlations between them and potential cross-loadings are able to capture the concept described. As a rule, Cronbach's alpha cut-off value is 0.7, however small negative deviations are acceptable (Cooper and Schindler, 2006; Malhotra and Birks, 2006). The results of Cronbach's alphas test are presented in table 13.

The results in table 13 indicate that most latent constructs have Cronbach's alpha coefficients higher than the cut-off value 0.7. Moreover, the composite Cronbach's alpha of the whole dataset is well above the threshold of 0.7. Thus, based on the preliminary test of Cronbach's alpha, all the latent constructs and its indicators were included in the CFA.

Table 13. Cronbach's alpha (a preliminary test of construct reliability)

Latent construct	**Number of indicators**	**Cronbach's alpha**
Supply Chain Collaboration Dimensions	7	0.881
Collaborative Advantage	4	0.755
Firm Performance	5	0.850
Operational Performance	5	0.732
All items	34	0.897

Following the preliminary test of reliability by means of Cronbach's alpha, CFA was conducted to ensure composite, convergent and discriminant validity along with construct reliability (Gerbing and Anderson, 1988) as well as the overall model fit. Each indicator loading was treated as an a priori indicator for the latent construct it measures, and all the latent constructs were allowed to be correlated as there was no ground for an assumption that latent constructs are not correlated. The output for the measurement model after the initial CFA is included in Appendix 2.

Measurement model fit assessment shows how well the observed data fits the theoretical framework developed at earlier stages. The overall fit of the measurement model was assessed by means of several indices to have a better understanding of the goodness-of-fit. The rule of thumb suggests relying on, at least, one absolute fit index and one incremental fit index besides traditional $\chi 2$ results (Hair et al. 2010). The table below compares the expected measurement model fit indices for the good fit with the obtained ones.

Table 14. Initial CFA. Model fit assessment

Expected		**Obtained**
χ 2 normed	<2.0 – good fit	1.680 (good)
	2.0-5.0 – acceptable fit	
CFI	> 0.95 great	.804 (sometimes acceptable)
	> 0.90 moderate	
	> 0.80 sometimes acceptable	
RMSEA	< .05 good	.106 (bad)
	0.05 - 0.10 moderate	
	> 0.10 bad	

Source: (Hair et al., 2010; Van Dijk, 2016)

To find the areas of the measurement model improvement, construct validity is assessed along with modification indices. We start the analysis of construct validity with the analysis of convergent validity (factor loadings should be greater than 0.5, preferably higher than 0.7). The latent constructs CA and OP had some indicators with low loadings (<0.5) to their respective construct, which could be problematic for the model fit of the SEM model, considering the low sample size of the study. Table 15 below contains data on factor loadings produced after the initial CFA.

Table 15. Initial CFA. Factor loadings

Construct		**Indicator**	**Regressions parameter estimate (Beta)**
SCCD	→	Goal congruence	.637
SCCD	→	Knowledge creation	.698
SCCD	→	Collaborative communication	.646
SCCD	→	Resource sharing	.689
SCCD	→	Incentive alignment	.867
SCCD	→	Decision synchronization	.866
SCCD	→	Information sharing	.695
CA	→	Innovation	.657
CA	→	Offering flexibility	.794
CA	→	Process efficiency	.699
CA	→	Business synergy	.487
FP	→	Sales growth	.736
FP	→	Satisfaction with collaboration	.899
FP	→	Market share	.761
FP	→	ROI	.540
FP	→	Consumer satisfaction	.790
OP	→	On-time delivery	.866
OP	→	Order fulfillment lead time	.948
OP	→	Inventory turn	.563
OP	→	Total logistics costs	.402
OP	→	Stock-outs	.153

As the results in the table 16 show, several indicators had low factor loadings. In particular, the indicator of OP stock-outs had an extremely low loading (.153), which could be problematic in further analysis and, hence this indicator was regarded as a potential candidate for removal. Although some other indicators had loadings lower than the cut-off value of 0.5, in particular, business synergy (.487) and total logistics costs (.402). Rather than automatically eliminating such indicators, researchers should carefully examine the effects of item removal on the composite reliability, as well as on the construct's content validity.

The results of the CFA functioned as an input to conduct composite reliability, as well as convergent and discriminant validity tests. In particular, such tests as composite reliability (CR), average variance extracted (AVE), maximum shared variance (MSV), and average shared variance (ASV) tests were conducted. The threshold values for the mentioned tests are provided in table 16.

Table 16. Reliability and validity threshold values

Reliability and validity tests	**Cut-off value**
Composite reliability	>0.70
Convergent validity	CR > AVE
	AVE > 0.50
Discriminant validity	MSV < AVE
	ASV < AVE

Source: (Hair et al., 2010; Van Dijk, 2016)

The correlation table and standard regression weight table of the initial CFA served as an input for the reliability and validity tests. The results were calculated by means of an Excel macro (Gaskin, 2014). Table 17 summarizes the outcomes of reliability and validity tests.

As the result of testing reliability and validity, the latent constructs OP and CA had convergent validity issues (AVE<0.5), which signifies that the latent construct indicators do not correlate well with each other. The problem could lie in the low factor loadings of the indicators previously mentioned: stock-outs (.153), business synergy (.487) and total logistics costs (.402).

Table 17. Reliability and validity test results after initial CFA

	CR	AVE	MSV	FP	SCCD	CA	OP
FP	0.866	0.569	0.287	0.754			
SCCD	0.889	0.539	0.116	0.115	0.734		
CA	0.759	0.447	0.308	0.536	0.340	0.669	
OP	0.751	0.430	0.308	0.475	0.180	0.555	0.656

After removing the indicator with the lowest loading related to the construct OP, that is stock-outs, the reliability and validity analysis was run once more. The results of the new reliability and validity tests are presented in table 18.

Table 18. Reliability and validity test results after revised CFA

	CR	AVE	MSV	FP	SCCD	CA	OP
FP	0.866	0.569	0.287	0.754			
SCCD	0.889	0.539	0.116	0.115	0.734		
CA	0.758	0.446	0.304	0.536	0.340	0.668	
OP	0.803	0.530	0.304	0.468	0.178	0.551	0.728

According to the reliability and validity test results, the convergent validity of the construct OP improved and achieved the threshold value of 0.5, however that was not still true for the construct CA. However, following van Dijk (2016), since there was only one indicator with low reliability and it affected the model fit insignificantly, all items of the latent construct CA were included in the model, despite low loadings of some of them. The revised confirmatory analysis can be found in Appendix 3. The table below provides model fit indices after the revised confirmatory factor analysis. The model fit indicators were found to be acceptable for further analysis.

Table 19. Model fit indicators after revised CFA

Expected*		**Obtained**
χ 2 normed	<2.0 – good fit	1.355 (good)
	2.0-5.0 – acceptable fit	
CFI	> 0.95 great	.907 (moderate)
	> 0.90 moderate	
	> 0.80 sometimes acceptable	
RMSEA	< .05 good	.077 (moderate)
	0.05 - 0.10 moderate	
	> 0.10 bad	

3.4. Test of Common Method Bias

The revised CFA was further used to test the common method bias by means of a common latent factor (CLF), which captures the common variance among all observed variables in the measurement model. Afterwards, the standardized regression weights from the model with the CLF were compared with the standardized regression weights of the measurement model without the CLF. The measurement model with CLF is illustrated in Appendix 4. The CLF should be retained and moved to the structural model if there are differences greater than 0.2 between the standardized regression weights of the two models. The results of the comparison of the standardized regression weights are presented in the table 20.

As the table 20 demonstrates, the difference between the standardized regression weights of the model with CLF and the measurement model without CLF was not greater than the cut-off value 0.2; hence, the measurement model without CLF was hereinafter moved to the structural model.

Table 20. Comparison of standardized regression weights of the model with CLF and the model without CLF

Relationship			**Estimate (without CLF)**	**Estimate (with CLF)**	**Difference**
SCCD	→	Goal congruence	0.996	1	0.004
SCCD	→	Knowledge creation	0.528	0.499	-0.029
SCCD	→	Collaborative communication	0.34	0.291	-0.049
SCCD	→	Resource sharing	0.444	0.398	-0.046
SCCD	→	Incentive alignment	0.683	0.642	-0.041
SCCD	→	Decision synchronization	0.619	0.559	-0.06
SCCD	→	Information sharing	0.353	0.299	-0.054
CA	→	Innovation	0.496	0.564	0.068
CA	→	Offering flexibility	0.84	0.864	0.024
CA	→	Process efficiency	0.721	0.724	0.003
CA	→	Business synergy	0.265	0.363	0.098

FP	→	Sales growth	0.703	0.703	0
FP	→	Satisfaction with collaboration	0.936	0.939	0.003
FP	→	Market share	0.743	0.739	-0.004
FP	→	ROI	0.624	0.649	0.025
FP	→	Consumer satisfaction	0.775	0.772	-0.003
OP	→	On-time delivery	0.851	0.861	0.01
OP	→	Order fulfillment lead time	0.939	0.958	0.019
OP	→	Inventory turn	0.558	0.551	-0.007
OP	→	Total logistics costs	0.417	0.398	-0.019

3.5. Structural Equation Model of Supply Chain Collaboration

After conducting CFA and approving of the measurement model, the structural model can be put forward for the analysis by means of SEM. SEM represents a combination of linear equations that are used to test causal relationships between latent constructs (Hair et al., 2010). As a final result, SEM is used to identify to which extent the theoretically developed model fits observed data in the sample. The main difference between CFA and SEM is that in SEM the focus is shifted to relationships between latent constructs rather than the relationships between indicators and latent constructs. We used the measurement model without CLF to build the structural equation model that is illustrated in Appendix 5. The table below provides model fit indices for the structural model.

Table 21. Structural model fit assessment

Expected*		**Obtained**
χ 2 normed	<2.0 – good fit	1.355 (good)
	2.0-5.0 – acceptable fit	
CFI	> 0.95 great	.907 (moderate)
	> 0.90 moderate	
	> 0.80 sometimes acceptable	

RMSEA	< .05 good 0.05 - 0.10 moderate > 0.10 bad	.077 (moderate)

The results of the structural equation model showed that the latent construct SCCD had a significant positive effect on the latent construct CA (.408*). The latent construct CA had a significant positive influence on the latent construct OP (.520**) and the latent construct FP (.389*). Besides that, it is interesting to note that the control variable firm size had a significant negative effect on the latent construct CA (-.419*). No significant direct effects were observed for the relationship between SCCD and OP (.083) and between SCCD and FP (-.038). In addition, the relationship between OP and FP was also insignificant (.253). Table 22 presents the results of the standardized regression weights of the structural model.

Table 22. Standardized regression weights of the structural model

Relationship			Regressions parameter estimate (Beta)	P
SCCD	→	CA	.408*	.037
Firm Size	→	CA	-.419*	.010
CA	→	OP	.520**	.009
SCCD	→	OP	.083	.534
CA	→	FP	.389*	.028
SCCD	→	FP	-.038	.762
OP	→	FP	.253	.123
SCCD	→	Goal congruence	.615	
SCCD	→	Knowledge creation	.594***	***
SCCD	→	Collaborative communication	.637***	***
SCCD	→	Resource sharing	.670***	***
SCCD	→	Incentive alignment	.817***	***
SCCD	→	Decision synchronization	.923***	***
SCCD	→	Information sharing	.692***	***
CA	→	Innovation	.560	
CA	→	Offering flexibility	.911***	***

Relationship			Regressions parameter estimate (Beta)	P
CA	→	Process efficiency	.674***	***
CA	→	Business synergy	.355**	.003
FP	→	Sales growth	.703***	***
FP	→	Satisfaction with collaboration	.944***	***
FP	→	Market share	.737***	***
FP	→	ROI	.642***	***
FP	→	Consumer satisfaction	.771	
OP	→	On-time delivery	.859***	***
OP	→	Order fulfillment lead time	.961***	***
OP	→	Inventory turn	.548	
OP	→	Total logistics costs	.397**	.007

3.6. Mediation effect of Collaborative Advantage

According to the previously developed conceptual hypotheses framework, the latent construct CA is expected to positively mediate the relationship between the latent constructs SCCD and OP and between SCCD and FP. Hence, the mediation analysis was conducted in SPSS Amos 24. There are several methods to test the mediation relationships, such as Sobel's test (1982) and the Baron and Kenny approach (1986), which are regarded as more traditional ones. Both of the mentioned methods have low power compared to more modern approaches and are typically no longer recommended (e.g., MacKinnon et al., 2002; Biesanz, Falk, & Savalei, 2010). One of the most preferred methods currently is bootstrapping, which is a resampling method that is used to build a confidence interval for the indirect effect (Preacher & Hayes, 2004). One of the main advantages of the bootstrapping method is that it does not violate assumptions of normality and is therefore can be used for small sample sizes (Preacher & Hayes, 2004), which is the case in this research. Our mediation analysis was performed with 2000 bootstrap replications. To infer the observed significance level of the effects, nonparametric bootstrap bias-corrected confidence intervals were used. The results of the mediation analysis are presented in table 23.

The indirect effect of SCCD through the mediation variable CA on OP was positive and significant (.212**). The last two columns in table 23 show the upper and lower limits for the 95% confidence intervals. These values correspond to the 2.5th and 97.5th percentiles from lowest to

highest rank-ordered estimates of the indirect effect derived from the 2.000 samples. Since zero does not fall between the confidence interval ranging from 0.31 to .452, we can conclude that there is a significant mediation effect. Thus, it can be stated that collaborative advantage positively mediates the relationship between supply chain collaboration dimensions and operational performance of the firm.

Table 23. Indirect effect of SCCD through CA on OP and FP

Path	Estimate	P-value	Lower	Upper
SCCD → CA → OP	.212	.002	.031	.452
SCCD → CA → FP	.159	.067	-.006	.581

The indirect effect of SCCD through mediation variable CA on FP was positive, but not significant (.159), moreover the confidence interval range in this case does include zero, which means that CA does not mediate the relationship between SCCD and FP. In this case, we can propose that collaborative advantage form a sustainable advantage or superiority in operating activities.

CONCLUSIONS AND IMPLICATIONS

The purpose of this study, which is stated in the Introduction, was achieved by covering research objectives, also listed in the Introduction part. As a result of the research, a set of relationships between supply chain collaboration, collaborative advantages, operational performance and firm performance were identified. The purpose of the research was reached by (1) examining the concept of SCC and determining its key dimensions; (2) developing a conceptual model of the relationship between SCC and organizational performance; (3) testing empirically the model of the relationship between SCC and organizational performance using the example of a distribution network.

This study set out to answer three research questions, the empirical study has provided answers to them.

RQ1: What are the key dimensions of supply chain collaboration and how do they relate to performance of firms?

Based on the literature review, the following important dimensions of supply chain collaboration were determined: information sharing, decision synchronization, incentive alignment, resource sharing, collaborative communication, joint knowledge creation and goal congruence. The measurement model developed in this research was based on the conceptual SCC hypotheses framework, adapted from previous studies (Cao et al, 2011; van Dijk, 2016). The final measurement model was transformed into the structural equation model, which was used to test the hypotheses formulated in the conceptual SCC framework. The results of structural equation modeling (Fig. 5) showed that supply chain collaboration had a significant positive indirect effect on operational performance. Moreover, supply chain collaboration had a significant positive direct impact on collaborative advantages, whereas collaborative advantages had a significant positive direct influence on firm performance.

RQ2: What areas of collaboration are the most important for the organizational performance?

The results of multiple regression analysis showed that inventory management and promotion were the most important collaboration areas for organizational performance. Collaborative practices in inventory and promotion had positive significant effects on several firm performance indicators, namely: satisfaction with collaboration, consumer satisfaction and market share growth. Thus, collaboration between suppliers and their distributor in the areas of inventory management and promotion is particularly valuable and effective, since it results in suppliers' satisfaction with the collaboration. Moreover, collaboration in inventory management also resulted in increased market share. It can be explained by the fact that collaboration in inventory

management enables better information sharing between suppliers and distributor and more accurate forecasting, which increases the stock availability and reduces inventory costs. These advantages allow the collaborating firms to outpace competitors and increase the market share. In addition, collaboration in the area of promotion had a significant positive effect on consumer satisfaction and market share. The most reasonable explanation of this effect is that collaborative promotion can target consumers more effectively enabling tailored promotional offers. Moreover, collaboration allows to improve forecast accuracy in promotions and avoid stock-outs, which also results in increased consumer satisfaction. Effective consumer targeting, improved forecast accuracy, stock availability and reduced costs allow the firms to achieve better competitiveness and gain greater market shares.

RQ3: What are the crucial collaborative advantages and how do they influence the relationship between supply chain collaboration and performance of firms?

This study, consistently with the research by Cao and Zhang (2011) and van Dijk (2016), confirms that the most important collaborative advantages are offering flexibility, process efficiency, innovation and business synergy. As a result of the mediation analysis, the mediation effect of collaborative advantages on the relationship between supply chain collaboration dimensions and operational performance was established. Thus, collaborative advantage positively mediates the relationship between supply chain collaboration dimensions and operational performance of the firm. Moreover, the results of the research have shown that collaborative advantages have a positive direct influence on firm performance. Besides that, in this research the control variable firm size had a significant negative effect on the latent construct collaborative advantages. It means that there is an inverse relationship between firm size and collaborative advantage. The reason for this relationship is that smaller firms get more advantages relative to their firm size than larger firms. In the context of the examined distribution network, a variety of firms, ranging from small companies (50-100 FTEs) to the larger ones (more than 1000 FTEs) were examined. For small firms, the cooperation with a large distributor provides opportunities to increase the market share by leveraging the distributor's resources and advantages. In contrast, the larger firms are more competitive and have their own advantages that are no worse than the distributor's ones, hence, they do not aim to cooperate and access the distributor's resources.

The overall results of the structural equation modeling are presented in the Figure below.

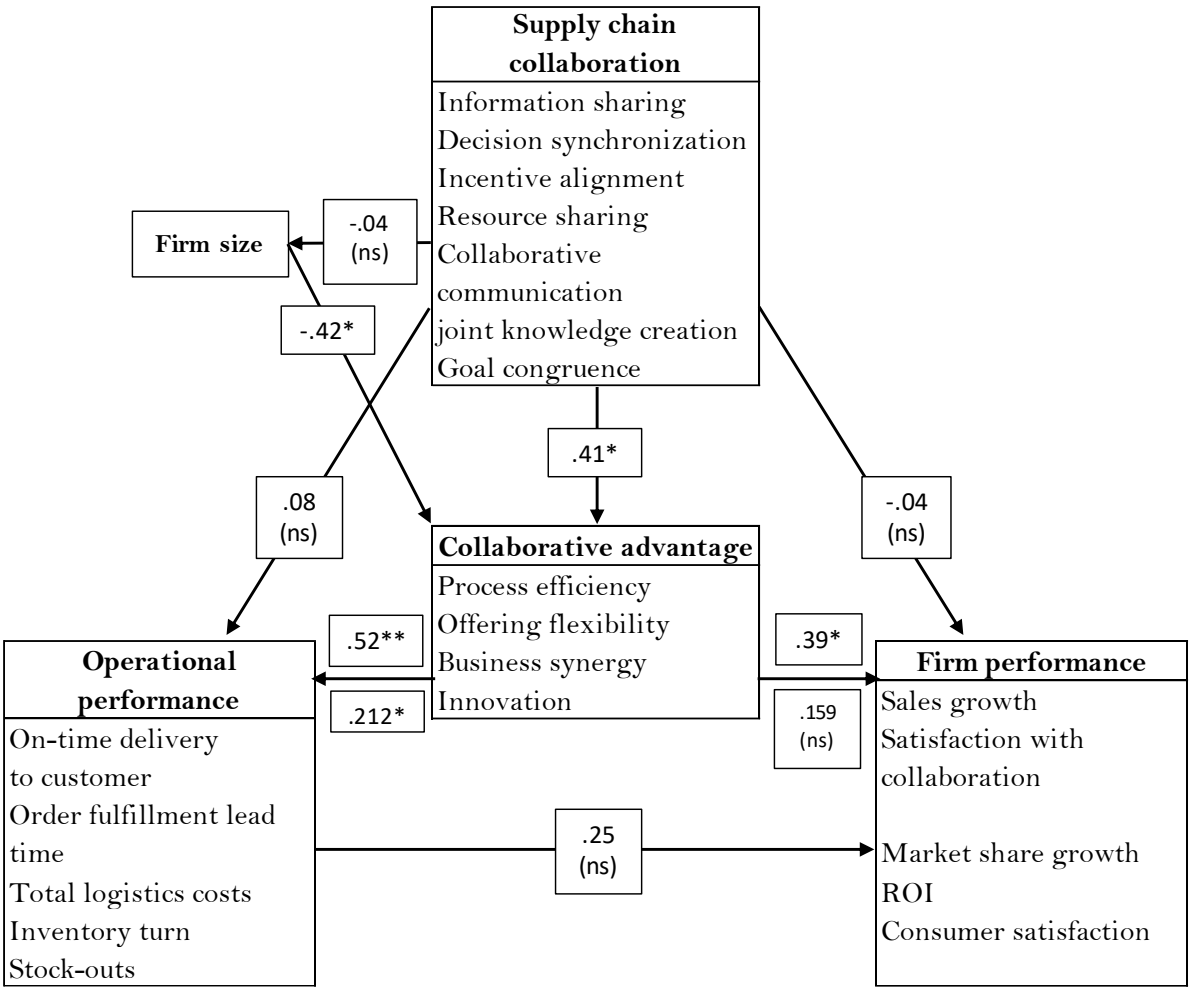

Fig. 7: SEM full model results of conceptual SCC hypotheses framework

Source: Author's own

Theoretical contributions. As it has been mentioned previously, the existing research on SCC shows inconsistent results on whether SCC improves organizational performance, moreover, it is unclear in which precise way collaboration influences firms' outcomes. This study makes several contributions to the understanding of supply chain collaboration and its implications for performance of firms. The important theoretical contribution is the development of the structural equation model of SCC. By testing this model, a positive indirect impact of SCC on operational performance was established. As the result of testing the relationships between supply chain collaboration dimensions, collaborative advantages, and operational and firm performance, this study has highlighted the critical role of collaborative advantage in linking collaboration to organizational performance. Whereas much of the previous studies were focused on direct relationship between collaboration and performance (Duffy and Fearne, 2004, Stank et al., 2001), this study, following Cao and Zhang (2011) and van Dijk (2016), considers an intermediate variable collaborative advantage and establishes its mediating effect on the relationship between

SCC and operational performance. Thus, this research has provided empirical support for previous studies of the effect of SCC on organizational performance (Cao and Zhang, 2011; van Dijk, 2016) and has found out that collaboration alone is not sufficient to improve operational performance. To this end, the collaborating firms should primarily achieve collaborative advantages, which further lead to better performance. Thus, this master thesis adds greater comprehensiveness and richness to the SCC research.

Managerial implications. From the practical point of view, the findings of this study have a number of managerial implications that could provide valuable insights for companies involved not only in distribution networks, but also in other types of supply networks. The research results demonstrate that collaboration between firms in the supply chain has a positive effect on collaborative advantage. It follows that the supply chain partners practicing collaboration should strive to improve their information sharing, decision synchronization, incentive alignment, resource sharing, collaborative communication, joint knowledge creation and goal congruence in order to achieve and maintain a high level of collaborative advantage for their supply chain. Moreover, positive significant relationships were established between collaborative advantages and operational and firm performance. It can therefore be assumed that managers willing to improve organizational performance should put efforts into developing flexibility, process efficiency, business synergy, and innovation together with the supply chain partners.

An important finding of this study is that the effect of SCC on operational performance is fully mediated by collaborative advantages. Therefore, firms willing to improve operational performance by practicing collaboration, should first ensure the achievement of collaborative advantages. There are different definitions and measures of collaborative advantages, which can help managers to improve shared supply chain processes and achieve benefits for all members. However, this study, consistently with the research by Cao and Zhang (2011) and van Dijk (2016), confirms that the use of such collaborative advantages as offering flexibility, process efficiency, innovation and business synergy is the most efficient. Ignoring collaborative advantage may be one of the reasons why so many firms failed to develop effective collaboration in their supply chains. Obtaining collaborative advantages may help overcome the challenges and complexities in inter-firm collaboration that a variety of companies have faced. In the first chapter of this thesis, collaborative advantage is referred to as inter-organizational competitive advantage, which seeks to maximize a common profit for all supply chain members. This synergetic effect of the collaborative advantage is what drives the organizational performance improvement. It arises due to collaboration efforts of the supply chain partners, and it is obtained only through joint action and close collaboration. That is why, it is suggested that, in order for a supply chain as a whole to perform well, firms should try to create a win–win situation that all participants collaborate to

achieve business synergy and compete with other chains. According to Cao and Zhang (2011), generally, competitive intentions make individual firms promote their own interests at the expenses of others, which is very insidious for collaboration and can worsen or destroy the relationships. Long-term relationships such as supply chain collaboration have to be motivated by the mutuality of intent, goal congruence, and benefit sharing. Thus, managers need to align goals and benefits with supply chain partners for creating collaborative advantage. Such collaborative advantage indeed directly increases the performance for each partner in the chain.

As the empirical results of this study show, the main instrument of obtaining collaborative advantages is the dimensions of supply chain collaboration. Under the conditions of the growing uncertainty of business environment and increasing competition, decision synchronization, incentive alignment and information sharing come at the forefront. Practicing these collaborative dimensions allow firms to improve process visibility and reduce the uncertainty level in decision-making.

Another interesting finding of this research has important practical implications, namely that smaller firms get more advantages relative to their firm size than larger firms.

Finally, the empirical findings showed that collaboration in such areas as inventory management, supply chain design and promotion leads to the most significant improvements in several performance indicators, namely: satisfaction with collaboration, consumer satisfaction and market share growth. Since the term collaboration cannot be considered apart from operational activity, most collaboration areas are related to operational functions, not only to strategic management.

In conclusion, after summarizing all the empirical and statistical analyses and formulating the conclusions and implications, the main contribution of this research is that in line with the research by Cao and Zhang (2011) and van Dijk (2016), this study found that the performance of firms practicing collaboration in the supply chain can be improved by obtaining collaboration advantages first.

LIMITATIONS AND FURTHER RESEARCH

This study is subject to some limitations that can be addressed in further research. Most of the limitations in this study are associated with a small sample size (n=61). Unfortunately, despite efforts to increase the sample size (sending a reminder letter to the sample representatives, asking for support from the managers of the focal firm who are in charge of the relationship with suppliers), the number of the responses did not increase. The small sample size did not allow to test some categorical moderations, for instance, in terms of firm size or industry category. Besides that, the SEM model fit, as well as reliability and validity test results could be improved by a larger sample size. Due to the low sample size, some reliability and validity issues occurred and one indicator of operational performance was removed from the study.

Another limitation is related to the sample characteristics: it encompasses mainly Russian firms operating in the single industry. Taking into account that each industry has its specific features, future research should be aimed at studying networks of firms operating in other industries. By extending the context in which the data are collected (e.g. retailers, resellers), a more comprehensive relation between supply chain collaboration and firm performance could be investigated.

Most of the existing research focuses on the dyadic relationship in supply chain, whereas future research could contribute to the field of supply chain management by investigating the collaborative relationships from the multi-tier perspective and comprising not only the perspective of one party in the relationship, but examine it as a bilaterally or multilaterally.

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APPENDICES

Appendix 1. Survey questionnaire questions (English version)

Section I: Company Profile

1. Company's name
2. Country
3. Industry
4. Select the number of full time employees in your company
    - 50-100
    - 101-250
    - 251-500
    - 501-1000

Section II: Supply Chain Collaboration Indicators

5. Estimate the length of relationship with your distributor
    - <1 year
    - 1-5 years
    - More than 5 years

6. What is the type of supply chain relationship strategy with your distributor
    - Independent relationship (Competitive type of strategy): prices are established based on the market forces
    - Mutually beneficial relationship (Cooperative type of strategy): developing new value in the process of cooperation
    - Controlling relationship (Command type of strategy): one of the parties controls most operations in the supply chain

7. What is the most important determinant in the supply chain with your distributor
    - Agreed Price Level
    - Volume of Purchases
    - Distributor's Ability to Pay on Time

- The opportunity to work in the Unified Information System
- Distributor's Market Position

8. Indicate the extent of collaboration with your distributor in the following areas (Very little extent, Little extent, Some extent, Great extent, Very great extent)
    - Production
    - Inventory management
    - Distribution
    - R&D
    - Supply chain design
    - Product development
    - Promotion

9. To what extent does your company use the following supply chain collaboration components with your distributor (Very little extent, Little extent, Some extent, Great extent, Very great extent)
    - Information sharing
    - Decision synchronization
    - Incentive alignment
    - Resource sharing
    - Collaborative communication
    - Joint knowledge creation
    - Goal congruence

10. Supply chain collaboration with your distributor leads to the following collaborative advantages (Strongly disagree, Disagree, Neutral, Agree, Strongly Agree)
    - Process efficiency (company meets: unit costs, productivity standards, on-time delivery & inventory requirements)
    - Offering flexibility (company offers and meets: customer responsiveness, variety of products, customized product & customer volume requirements)
    - Business synergy (integrated: IT, knowledge bases, marketing efforts & production systems)
    - Innovation (rapid product development, low time-to-market, quick new product introduction & frequent innovation)

Section C: Propositions on Supply Chain Collaboration Development

11. Our company conducts the following collaborative planning practices with our Russian buyer(s) / customer(s) (Strongly disagree, Disagree, Neutral, Agree, Strongly agree)
    - Design (control over product design)
    - Promotion (planning sales promotions)
    - Information sharing (sharing business plans)
    - Production (sharing production plans)
    - Replenishment (sharing delivery plans)

12. Our company executes the following collaboration practices with our distributor (Strongly disagree, Disagree, Neutral, Agree, Strongly agree)
    - Timely delivery (items delivered on-time)
    - Investment (investment on technology and other resources to support collaboration)
    - Joint team work (execution of plans jointly)
    - Resource sharing (shared use of resources such as IT and warehouse)
    - Cost reduction

13. Our company realizes organizational improvements by collaboration with our distributor in the following areas (Strongly disagree, Disagree, Neutral, Agree, Strongly agree)
    - Sales (sales growth)
    - Satisfaction (satisfaction in collaborative relationships)
    - Market share (improvement in company's market share)
    - Return on investment (ROI)
    - Customer satisfaction

14. Our company realizes operational improvements by collaboration with our distributor in the following areas (Strongly disagree, Disagree, Neutral, Agree, Strongly agree)
    - On-time delivery
    - Order fulfillment lead time
    - Total logistics cost
    - Inventory turns
    - Stock-outs

15. Which elements of interaction with your distributor could significantly increase the efficiency of collaboration:
16. What important terms should be added in the contract with you distributor in order to achieve the maximum effectiveness of collaboration:
17. What are the most frequent issues of collaboration with your distributor:

Section D (only for non-Russian companies): Environmental dissimilarities & barriers of doing business

18. Indicate to what extent the following barriers are jeopardizing and affecting supply chain operations of doing business with your Russian buyer(s) / customer(s) (Very little extent, Little extent, Some extent, Great extent, Very great extent)
    - Strong international competition
    - High business risk
    - Different customer culture
    - Unfamiliar foreign business practice
    - High tariff and non-tariff barriers
    - Unfavorable foreign exchange rates
    - Lack of government assistance
    - Restrictive rules and regulation
    - Transportation difficulties
    - Bureaucratic requirements
    - Limited information about markets

19. Indicate to what extent the following barriers are jeopardizing and affecting collaboration activities with your Russian buyer(s) / customer(s) (Very little extent, Little extent, Some extent, Great extent, Very great extent)
    - Lack of trust
    - Lack of training for new mindset and skills
    - Lack of collaborative and strategic planning
    - Lack of top management commitment
    - Lack of supply chain vision/understanding
    - Differences in technological capability
    - Inadequate information sharing

- Unwillingness to share risk and reward
- Inconsistent and inadequate performance metrics

Appendix 2. Survey questionnaire questions (Russian version)

РАЗДЕЛ 1: Данные о компании

1. Название организации _____

2. Страна _____

3. Отрасль промышленности_____

4. Укажите число постоянных сотрудников в вашей компании

- 50-100
- 101-250
- 251-500
- 501-1000
- Свыше 1000

РАЗДЕЛ 2: Показатели сотрудничества в цепи поставок

5. Укажите продолжительность сотрудничества с Вашим дистрибьютором:

- Менее 1 года
- 1-5 лет
- Более 5 лет

6. Какой тип стратегии характерен для взаимоотношений с Вашим дистрибьютором?

- Независимые отношения (Конкурентный тип стратегии): цена на продукцию устанавливается на основе рыночных сил партнеров;
- Взаимовыгодные отношения (Кооперативный тип стратегии): в процессе взаимодействия формируется новая ценность;
- Контролирующие взаимоотношения (Командный тип стратегии): одна из сторон контролирует большую часть операций в цепи.

7. Что для вашей компании является определяющим при взаимодействии с Вашим дистрибьютором в цепи поставок?

- Согласованный уровень цен на продукцию
- Объем закупок

- Уровень платежеспособности дистрибьютора (своевременная оплата)
- Возможность работы в единой информационной системе
- Рыночное положение дистрибьютора (доля рынка)

8. Оцените уровень сотрудничества с Вашим дистрибьютором в следующих процессах (укажите значение напротив каждого пункта от 1 до 5, 1 – отсутствие вовлеченности, 5 – совместное принятие решений)

- Производство
- Управление запасами
- Распределение
- Научные исследования и разработки
- Проектирование цепи поставок
- Разработка новой продукции
- Продвижение продукции на рынке

9. Оцените, в какой степени Ваша компания использует следующие элементы взаимодействия с дистрибьютором? (укажите значение напротив каждого пункта от 1 до 5, 1 – в незначительной степени, 5 – в высшей степени)

- Обмен информацией
- Синхронизация решений
- Согласование стимулов
- Совместное использование ресурсов
- Коммуникация в рамках сотрудничества
- Совместное создание знаний
- Согласование целей

10. Взаимодействие с дистрибьютором в цепи поставок позволяет вашей компании добиться следующих преимуществ (укажите значение напротив каждого пункта от 1 до 5, 1 – полностью не согласен, 5 – полностью согласен):

- Эффективность процессов (контроль затрат на единицу продукции, стандарты производительности, требования своевременной доставки и необходимый уровень запасов)
- Гибкость (компания способна быстро реагировать на запросы заказчика, предлагать широкий ассортимент продукции, изготавливать продукцию по индивидуальному заказу и в объемах, необходимых клиенту)

- Бизнес-синергия (интеграция IT, баз знаний, маркетинговых мероприятий и систем производства)
- Инновации (ускоренные разработка, выпуск и внедрение новой продукции на рынок, постоянные инновации)

РАЗДЕЛ 3: Развитие сотрудничества в цепи поставок

11. Укажите, какие из следующих этапов планирования, Ваша компания осуществляет совместно с дистрибьютором (укажите значение напротив каждого пункта от 1 до 5, 1 – полностью не согласен, 5 – полностью согласен)

- Разработка нового продукта (контроль над разработкой продукции)
- Продвижение продукта на рынке (планирование продвижения и продаж)
- Совместное использование информации (совместная разработка и планирование проектов)
- Производство (совместное планирование производства)
- Пополнение запасов (совместное планирование поставок)

12. Ваша компания применяет следующие практики сотрудничества с дистрибьютором

(укажите значение напротив каждого пункта от 1 до 5, 1 – полностью не согласен, 5 – полностью согласен)

- Своевременная доставка
- Инвестиции (инвестиции в технологии и другие ресурсы, способствующие сотрудничеству)
- Совместная работа (совместное исполнение планов)
- Совместное использование ресурсов (например, IT или складских помещений)
- Сокращение издержек
- Отгрузка товара фиксированными партиями
- Отсрочка платежа

13. Сотрудничество с дистрибьютором позволяет вашей компании достичь организационных улучшений в следующих сферах (укажите значение напротив каждого пункта от 1 до 5, 1 – полностью не согласен, 5 – полностью согласен)

- Продажи (рост продаж)
- Удовлетворенность (удовлетворенность сотрудничеством)
- Доля рынка (увеличение рыночной доли компании)

- Доходность инвестированного капитала (ROI)
- Уровень удовлетворенности потребителя

14. Сотрудничество с дистрибьютером позволяет вашей компании достичь операционных улучшений в следующих операционных сферах (укажите значение напротив каждого пункта от 1 до 5, 1 – полностью не согласен, 5 – полностью согласен)

- Своевременная доставка товара до потребителя
- Время выполнения заказа
- Общие логистические издержки
- Оборачиваемость запасов
- Истощение запасов

15. Укажите, какие из элементов взаимодействия с Вашим дистрибьютором могли бы значительно повысить эффективность сотрудничества:

_____

16. Укажите, какие наиболее важные пункты должны быть внесены в контракт с дистрибьютором для достижения максимального уровня эффективности взаимодействия:

_____

17. Укажите, какие проблемные вопросы возникают наиболее часто при взаимодействии с Вашим дистрибьютором:

_____

РАЗДЕЛ 4 (только для иностранных компаний): Различия во внешней среде и барьеры ведения бизнеса

18. Укажите, в какой степени следующие виды барьеров создают риски и влияют на операции в цепи поставок с вашим российским дистрибьютором (укажите значение от 1 до 5 напротив каждого пункта, 1 – в незначительной степени, 5 – в высшей степени)

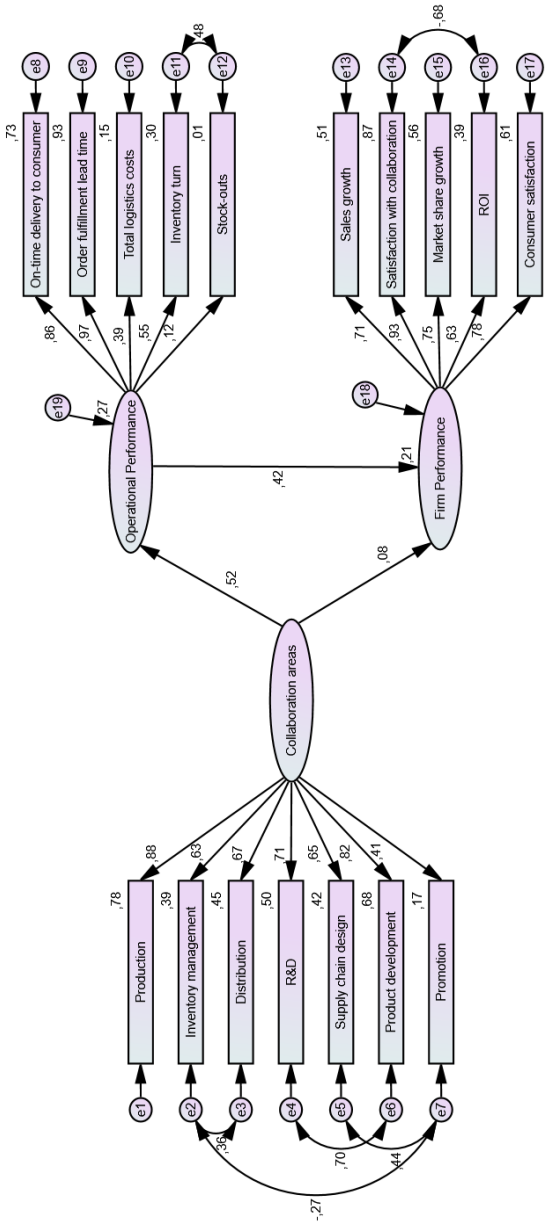
- Высокий уровень международной конкуренции
- Высокие риски ведения бизнеса
- Культурные различия клиентов
- Незнакомые бизнес-практики

- Высокие тарифные и нетарифные барьеры
- Неблагоприятные обменные курсы валют
- Недостаточная поддержка со стороны государства
- Ограничительные меры и регулирование
- Транспортные трудности
- Бюрократия
- Ограниченный объем информации о рынках

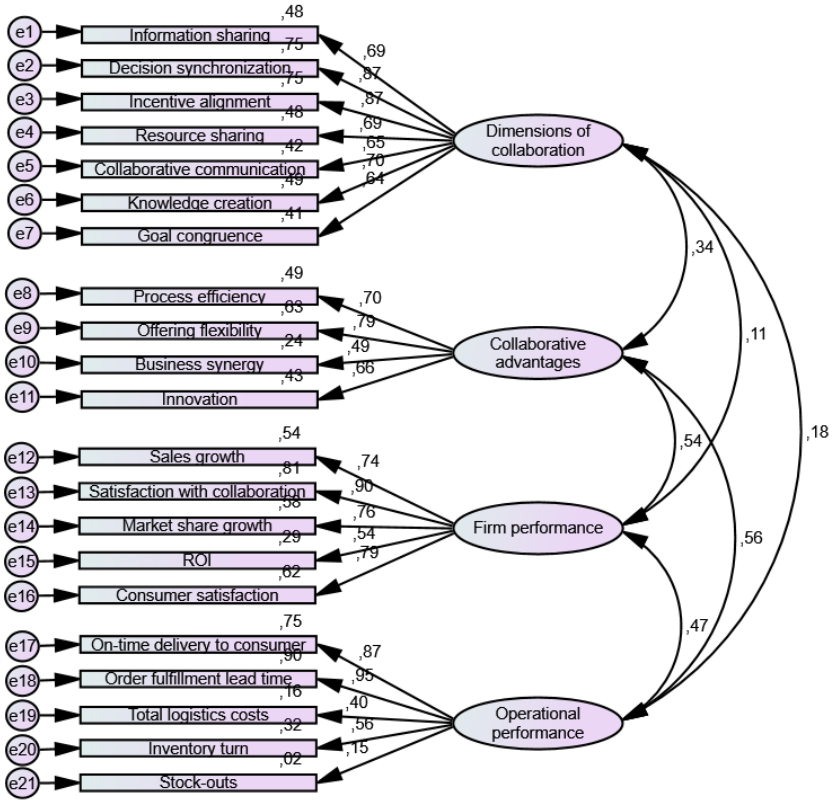
19. Укажите, в какой степени следующие виды барьеров создают риски и влияют на сотрудничество с вашим российским дистрибьютером (укажите значение от 1 до 5 напротив каждого пункта, 1 – в незначительной степени, 5 в высшей степени)

- Недостаточный уровень доверия
- Недостаточный уровень развития нового мышления и навыков
- Недостаточный уровень интегрированного и стратегического планирования
- Недостаточный уровень вовлеченности руководства
- Недостаточный уровень понимания цепи поставок
- Различный уровень технологических возможностей
- Недостаточный уровень обмена информацией
- Неготовность разделять риски и выгоды
- Несоответсвующая метрика производительности

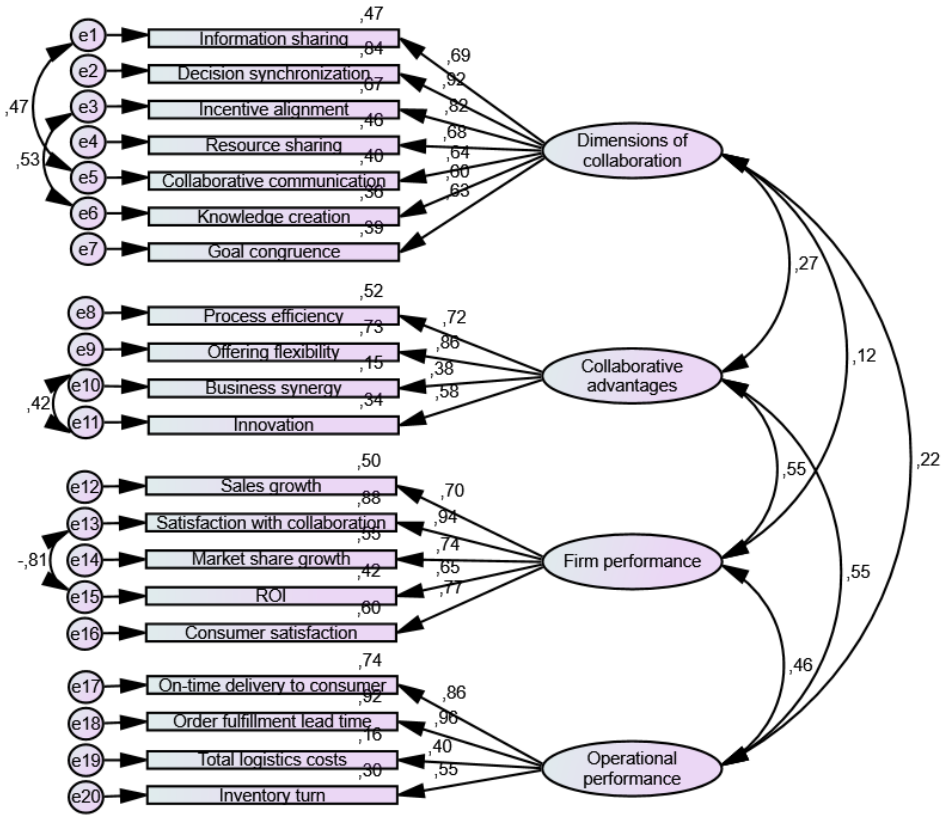
Appendix 3. Path Diagram of Collaboration Areas



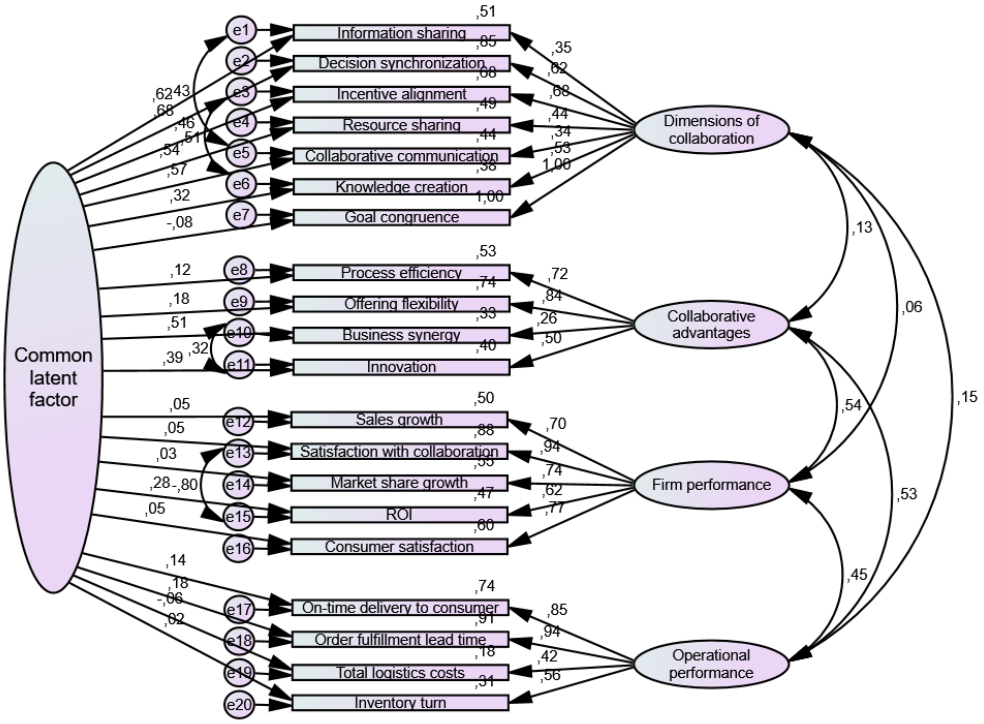
Appendix 4. Results of Initial Confirmatory Factor Analysis



Appendix 5. Results of Revised Confirmatory Factor Analysis



Appendix 6. Results of Confirmatory factor analysis with a Common Latent Factor



Appendix 7. Results of the Structural Equation Model of Supply Chain Collaboration